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THE REWARD OF AN ENERGETIC NEW BUSINESS POLICY.

Some figures which have just come to hand covering the last three years' operations of a central station of about 6,000-kilowatt rating illustrate in a striking degree the wisdom of an aggressive commercial policy in a company formerly contented to accept the business which naturally came its way, but rather disinclined to seek new sources of income along the lines of vigorous publicity and active solicitation. The total earnings of the company in 1910 were $380,000 and its total sales of energy were 5,870,000 kilowatt-hours. In the fiscal year 1912, just closed, the company earned $558,000, and its energy sales were 12,000,000 kilowatt-hours, an interesting tribute to the double program of installing a new executive and business organization and of spending a little more time and money on advertising. The name of the company, out of respect to the hard-working predecessors of the present management, who devoted the best years of their lives to its service and maintained its profits on a high plane for many twelvemonths, need not be stated here; the significant lesson of the company's history, and one which may well be carried home to many others, is the result of a complete change in administrative ends and aims which began about two years back. How was the result attained, and what is its present significance?

The present head of the company, an experienced central-station manager of thorough technical and commercial training, succeeded chief executives having other business interests, little technical knowledge, and a small staff of men trained for the most part in the direction of securing extremely efficient station operation rather than this combined with as extensive an electrification of the city as a red-blooded new-business organization could compass. In the old days the public reached the company's main and only office by a trip of nearly a mile from the business center; little selected newspaper advertising was carried, and the power field in particular was barely scratched. In the new deal an attractive business office with first-class show-window spaces and inside equipment for demonstrating apparatus was established in the heart of the city; the directors engaged a new executive at the almost unheard of salary of $10,000 and backed up from the first the employment of a soliciting organization composed of technically and commercially trained men capable of

solving the problems of electric lighting and power prospects upon an engineering basis. The new management, including some of the most progressive subordinate officials of the old regime, was established in the central office, and the public was encouraged with the utmost informality to become acquainted with the personnel and to find out by immediate contact with the executives, that their interests and the company's were one and the same.

As a result, the power income has risen from $66,000 to $161,000 and the power sales from 1,600,000 to 6,600,000 kilowatt-hours, while the commercial lighting revenue has gone from $229,000 to $300,000. In two years the number of customers has risen from 3,100 to 4,200; the use of electricity has been greatly popularized in the community and the public sentiment is far better than in the old days when the impression went abroad that the company was indifferent to new business plans and preferred to make its dividends at tolerably high rates with a small volume of output to the present plan of doing a large business with a somewhat smaller unit profit.

A NOISELESS PRODUCE AUCTION.

Having been in the habit of associating Boards of Trade and other produce marts with the simultaneous yelling of a score or more of strong-lunged men, most of us have grown to view such a bedlam as indispensably connected with the auctioning or wholesaling of food staples. But while the connection between the two may seem indispensable, we may only have been waiting for some electrical devices to come to the rescue of those whose ears and nerves are suffering daily under the strain of the pandemonium which rages in the wheat or corn pits at our larger trade centers.

Judging from recent progress in Europe, the dodging of the deafening noise may be comparatively a simple matter, as the greatest difficulties of the problem seem already to have been solved by the Hollanders in a way that has stood the tests of continued practice. Eight years ago the poultry raisers of Roermond and vicinity formed a co-operative organization and started the practice of auctioning their eggs every Saturday. Thanks to this influence of the movement, the methods employed by the individual chicken raisers have been greatly improved and have been systematized even to the extent of their all keeping only a single variety of chickens—the white American Leghorn. Consequently, the eggs are fairly uniform and when they are packed in cases of 500, the size of the eggs can easily be judged from the net weight of the 500, as marked on the case. Since the eggs are auctioned off every week, they will never be more than 10 days old and the town officials of each place (for some 90 villages are included in the Co-operative Egg Mart of Roermond) make sure that the eggs are not badly soiled.

Having been brought to the mart, the eggs are arranged in lots of 2,500, each lot being numbered. Likewise, each one of the intending purchasers is given a number and takes a correspondingly numbered seat. The presiding official stands before a large dial inscribed with prices ranging by small steps from an unreasonable maximum to a very low figure. Beside this dial is an annunciator having its drops connected to push buttons at the numbered seats.

When the sale or auction is to begin, the leader announces the number of the batch offered (each lot comprising 2,500) and the net weight per average case. Then a bell sounds as the pointer on the large dial slowly moves over the decreasing scale of figures, giving the price in florens after this fashion: 5.90, 5.70, 5.50, etc. When the price is reached which a purchaser is willing to pay, he presses the button at his seat, whereupon a gong rings while the annunciator shows his number and the pointer on the dial is halted. A slight pause allows the secretary quietly to note the sale, after which the official in charge proceeds to offer the next batch. Thus no shouting is needed at all and no talking other than the announcing of each lot by the presiding officer. Instead of having a horde of men frantically jumping and shouting, we have the spectacle of a quiet sale—one which must appeal to the staid Hollander who simply pushes the button and lets electricity do the rest.

Of course, the systematizing due to the raising and offering of only a single brand of eggs simplifies the selling to some extent. But even if allowance must be made for added factors in auctioning other products, why should this be difficult in adapting the same general plan to American practice? Apparently, this is a field to which our electricians have not given much thought and one which should warrant their early and serious attention.

PADDING A SPECIFICATION.

It is said that people like to be fooled, and one sometimes sees specifications for interior wiring which seem to betray a marked tendency to take advantage of this alleged weakness. On what other grounds, for example, than an unwarranted desire to give it an imposing appearance, in the eyes of the uninitiated, could the rather frequent practice of inserting unnecessary details in a specification be explained? It is common knowledge among electricians, of course, that most of the materials of inside electrical construction are pretty thoroughly standardized, and that in drawing a specification it is generally sufficient to insist on the use of standard, approved supplies. And yet some specifications are made to contain an elaborate and tedious enumeration of the qualities of materials suitable for wiring, with more or less detailed descriptions of the tests which they should be able to withstand. The Na-

tional Electrical Code covers such matters as this so completely that portions of a specification of the kind in question are very liable to look like practically literal reproductions of parts of the Code itself.

While there is nothing particularly culpable in drawing a specification in the manner referred to above, it does lead one to feel that a conscious and deliberate effort has been made to impress the customer especially with the skill of the man drawing it. If some competitor happens to call the customer's attention to this, the effect actually produced is liable to be just the opposite of the effect apparently sought.

Since, as a rule, the customer knows little or nothing about electrical matters, a specification means very little that is definite to him. It is generally more of an agreement between the contractor and the supervising engineer than anything else, and it need, therefore, only be sufficiently explicit to be easily understood by them; that is, to leave no possibility of a doubt in the mind of either one of them as to what is wanted. In the interest of dignity and brevity anything more than this may usually very well be left out.

FILLING THE NOON VALLEY.

The central-station daily load curve should be as significant to the progressive manager as an indicator diagram is to a steam engineer. It is noteworthy that the importance of this method of analysis is now being recognized in the work of the state commissions which are farthest advanced in efficient regulation of public utilities, and some companies are required to submit as a part of their annual returns load curves showing the hourly station outputs on the days of maximum and minimum demands upon their plants.

A study of these curves has recently emphasized the great importance of doing something to fill the gap in the output occasioned by noon shut-downs. In a typical case, the output of a company serving a manufacturing city of 150,000 inhabitants ran from 7 to 11:30 a. m. at about 2,800 kilowatts; at exactly noon the load dropped to 1,100 kilowatts, and it was not until 2:00 p. m. that the maximum output of the forenoon was again reached. Nearly 3,000 kilowatt-hours, selling at the average power rate of two and one-half cents, and therefore, costing the company a revenue loss of $75 per day, represented the commercial value of the noon period. Besides this, there was a real, though somewhat uncertain, loss sustained by the company in station operation due to the expense of cutting units in and out of service to fit the external demand upon it before and after the noon period. This might easily run to $500 or $600 a year, so that a conservative estimate of the total cost of the noon valley to the company would be, say, from $20,000 to $25,000 per year.

The first line of attack on such a course of inefficiency in earning power is obviously an effort to induce manufacturers to allow, say, half an hour for the noon layoff, and if it is possible in some cases, to arrange the work of various productive departments so that the minimum possible interruption shall occur during the lunch period. In such cases it may be possible to close during some seasons of the year a half hour earlier in the afternoon, and off the lighting peak, a policy which is greatly appreciated in some factories, since the short nooning is frequently regarded as little more than a breathing spell, while an extra half hour at night has many well-known advantages to the workman, coming as it does at the end of the day when he is free to visit the retail shops and amusement establishments without the sense of pressure which every busy man feels during the regular noon period. Again, it may be possible in some places to arrange for the continuous operation of ventilating fans, pumps, and heavy machines taking slow and automatic cuts on material which requires almost no watching once it is set in place—a plan which may commend itself to the manufacturer quite as much as to the central station. Space will not permit a detailed consideration of these possibilities, but there is not the slightest doubt that in encouraging the more general use of the noon hour, the efficiency expert and the central-station manager can well afford to co-operate. The field here is one of the utmost technical and human interest.

It is not only in the re-adjustment of existing load conditions, however, that the possibilities of filling the noon valley appear worth taking up. New business must be secured, and the most suggestive field is occupied by the very necessity which gives pause to industrial production in the middle of the day. The restaurant load, extension of special phases of electric heating and cooking, and the more complete applications of current-consuming devices in hotels and residences offer desirable business to the central station. Even in cities of less than 150,000 population the habit of dining or lunching down-town at noon is growing rapidly as the industrial pace quickens. More and more the urban population resorts to labor and time-saving establishments of this kind; new department stores are fitting up cafes and lunch rooms in locations demanding the most extensive escalator and elevator facilities; the cooking of certain kinds of foods is being done more and more in windows by forced methods of heating; congestion in long-established and popular eating places needs to be relieved by the use of more dumb-waiters of the electrically driven type; and finally, there is a most attractive opportunity for the use of special electric lighting in many of these houses during just the hour when the factory load sags off to the annoying minimum above described. One cannot escape the conclusion that a careful study of the noon-hour load situation in many cities will repay the effort.

Convention of the Association of Edison Illuminating Companies.

The twenty-eighth annual meeting and the thirty-third convention of the Association of Edison Illuminating Companies was held at the Homestead Hotel, Hot Springs, Va., September 10, 11 and 12. Sessions were held Tuesday morning and Tuesday evening, Wednesday morning and Wednesday evening, and Thursday morning and Thursday evening when a number of papers were read and discussed at length.

The following officers were elected for the ensuing year:

President, Arthur Williams, New York.

Vice-president, William Chandler, Sault Ste. Marie, Ont.

Secretary, George C. Holberton, San Francisco.

Treasurer, Louis A. Ferguson, Chicago.

Assistant Secretary, Walter Neumuller, New York.

Executive Committee: Arthur Williams, chairman, New York; Samuel Insull, Chicago; Charles L. Edgar, Boston; John W. Lieb, Jr., New York; Joseph B. McCall, Philadelphia; W. W. Freeman, Brooklyn; William Chandler, Sault Ste. Marie; Louis A. Ferguson, Chicago; George C. Holberton, San Francisco.

Jovian Activities.

The annual Congress of the order of the Rejuvenated Sons of Jove will be held at Pittsburgh, Pa., October 14, 15 and 16. Headquarters will be established at the Fort Pitt Hotel. Robert L. Jaynes, Tenth Jupiter, has appointed 100 active Jovians on sixteen separate committees to look after the preparation of hotel accommodations, the banquet, street parade and meeting.

It is expected that the preliminary campaign looking to the election of the eleventh Jupiter will be a very lively one, in some respects out-rivaling the activities of this time last year. W. M. Deming, Schenectady, N. Y., has announced his candidacy, as has also Frank E. Watts, of New York. Both candidates are active workers in the Jovian field, and have a host of friends who feel that they can rely upon them tc carry forth actively the great work which has been so happily inaugurated. Mr. Watts is Statesman for New York City, and under his direction there the Order has been greatly augmented in strength and membership. Mr. Deming is an old-time Jovian, having joined the Order in Chicago in 1906. He has been very active at Schenectady and helped to break the record for membership there at one of the recent Rejuvenations.

New Basis of Charging for Radiograms—New Wireless Regulations.

The Marconi Company of America is about to announce a new basis of charging for radio telegrams between ship and shore. The present message rates will be canceled on November 1, and on that day word rates, both for ocean wireless and land lines, with a minimum charge of ten words, will become effective.

The regulations for radio apparatus and operators on steamers issued by the Department of Commerce and Labor contain nothing new, and simply call attention to the amending act approved July 23 and published at the time. They embody the service regulations of the International Radio Telegraphic Convention held at Berlin, which has now been ratified by the principal maritime nations, dominions and provinces, the following nations being expected to confirm them in due course: China, Cuba, Dominican Republic, Haiti, Columbia, Ecuador, Peru, Panama, Venezuela, Costa Rica, Honduras, Nicaragua and Salvador. In the case of these countries the radio operator of any vessel, subject to the act, that is to say, carrying fifty persons or more, passengers and crew, must furnish to the inspector before the departure of the vessel from the United States evidence that he is "skilled in the use of the apparatus."

The act to regulate radio communication comes into effect December 13, 1912, and on and after that date, all operators will be required as a condition of employment to hold licenses, based on the requirements of the Berlin convention. Until that time the operator must hold "certificates of skill" to comply with the act which is effective October 1, so far as regards the compulsory carrying of two operators. The act so far as it relates to ocean cargo steamers takes effect April 1, 1913, for the Great Lakes, and July 1, 1913, for ocean cargo steamers, and on cargo steamers it is provided that in lieu of the second operator, there may be substituted a member of the crew or other person who shall be duly certified as competent to receive and understand distress calls or other unusual calls indicating danger, and to aid in maintaining a constant wireless watch necessary for the safety of life.

In shipping circles yesterday it was stated that in several instances steps had already been taken for the provision of a second operator. A large proportion of the domestic coastwise shipping, as the vessels do not carry the minimum number of 50 crew and passengers (if any) all told, is exempt from the act, but the value of the regulations is recognized.

American Mining Congress.

The annual meeting of the members of the American Mining Congress is called for Spokane, Wash., Tuesday, November 26, at 7:30 p. m., for the purpose of electing one director to hold office for one year, and four directors to hold office for three years.

In the general statement in the monthly bulletin for September, announcement is made that the report of the American Mining Congress upon the use of electricity in coal mines, presented to the Goldfield convention, has been repeatedly endorsed by other organizations and considered by various legislatures. The Legislature of Pennsylvania with very slight amendments enacted the complete recommendation of this committee. The special committee which has under consideration the use of electricity in metal mining operations will present a code for the use of electricity in metalliferous mines, the consideration of which will be given place on the platform.

The matter of water powers will be discussed particularly, and the question of the right of way over public domain will be considered.

Convention of Railway Electrical Engineers.

The fifth annual convention of the Association of Railway Electrical Engineers will be held in the Auditorium Hotel, Chicago, Ill., October 21 to 25.

The electrical men of all the big railroads of the United States and Canada will gather together for a conference on standardization of electrical practice on steam railroads, and many valuable papers and committee reports are planned.

The great hall occupying the ninth floor of the Auditorium Hotel has been reserved for convention exhibits, and judging from previous years, this space will all be taken by prominent manufacturers of electrical equipment.

As in previous years an excellent entertainment program will be provided.

Handsome Electric Sign of the Louisville Lighting Company.

A handsome electric sign, 20 by 25 feet in dimension, has been erected by the Louisville Lighting Company, of Louisville, Ky., upon the roof of a building on Fourth Avenue near Chestnut Street in that city.

The new sign typifies the company's arguments for more widespread use of electrical advertising. It is simple in design, but contains hundreds of tungsten lamps. Two blazing pillars, surmounted by torches, seeming to be columns of flame because of unique reflection devices, flank the phrases, "The Old Company" and "The Louisville Lighting Company."

Program of Iron and Steel Electrical Engineers' Meeting.

The annual convention of the Association of Iron and Steel Electrical Engineers will be held in Milwaukee, Wis., September 30 to October 5. The headquarters will be in the Hotel Pfeister. It is hoped among the engineers that tentative plans to form, at the Milwaukee sessions, a permanent Co-Operative Safety Congress, will be realized. Many prominent men will address the safety congress including a large number of representatives of firms who have been active in safety movements.

At the Safety Congress meetings, John Kirby, Jr., of Dayton, O., will be in charge of two of the sessions. Mr. Kirby is president of the National Association of Manufacturers. J. A. Holmes, chief of the Federal Bureau of Mines, will have charge of one session, as will Charles P. Neill, United States Commissioner of Labor, and R. C. Richards, of the Central Safety Committee of the Chicago and North Western Railroad.

The congress, while being held under the auspices of the electrical engineers, will have separate sessions. One exception is made, at this time the gathering being a joint one. Some of the best known men in the country will speak at the several sessions.

The program of the convention follows:

Monday, September 30—10 a. m.—Registration and business session for members and associates only.

2 p. m.—Papers.—"Blast Furnace Tops," A. E. Handy; "Mixed Pressure Turbines," E. D. Dickinson.

7 p. m.—Annual dinner (informal) for which the following speakers are announced:

Dr. Charles Neill, Commissioner of Labor, Washington, D. C.; Hon. James A. Emery, counsel National Association of Manufacturers; Mr. Campbell, of Chicago, attorney for the Illinois Steel Company. All of these gentlemen will speak for safety.

Tuesday, October 1.—9 a. m.—Papers.—"Automatic Speed Regulators," E. J. Cheny; "Proper Use of the Compound Field," R. B. Treat; "The Use of Alternating Versus Direct-Current Motors for Crane Service," M. A. Whiting.

2 p. m. Welding Session.—"Arc Welding," J. F. Lincoln; "Spot and Butt Welding," F. Warren.

Wednesday, October 2.—Illumination Session.—"Industrial Lighting," Ward Harrison; "Lighting Calculations," C. J. Mundo; "Industrial Lighting," C. E. Clewell.

Afternoon.—Entertainment.

Thursday, October 3.—9 a. m.—"Types of Winding of Electrical Machines," H. S. Specht; "Effect of Temperature on the Insulation of Dynamic Machinery," C. E. Skinner.

2 p. m.—Transmission Session.—"Fiber Conduit," Mr. Atchison; "Underground Cables," Palmer Collins; "Tubular Poles," W. T. Snyder; "Reinforced Concrete Poles," R. A. Cummings; "Structural Steel Poles," R. Fleming; "Underground Electrical Conduit Construction," (illustrated by lantern slides), W. W. Grant.

Afternoon.—Entertainment.

Friday, October 4.—All-day parallel session on safety papers.—"Dynamic Braking," R. B. Davenport; "Hoist Limits," E. H. Wentz; "Roll Train Drive," Wilfred Sykes.

Saturday, October 5.—Visits to local plants of interest.

For the Co-operative Safety Congress, an elaborate program has been announced.

B. R. Shover, of the Carnegie Steel Company, president of the Iron and Steel Electrical Engineers, has named the Milwaukee Entertainment Committee for the convention, with C. T. Henderson as chairman. The following have been named as members of the Entertainment Committee:

James Gardner, Allis-Chalmers Company, Milwaukee; W. T. Dean, General Electric Company, Chicago; Claiborne Pirtle, Electric Controller & Manufacturing Company, Cleveland; R. H. Kilner, Westinghouse Electric & Manufacturing Company, Chicago; A. F. Swartz, Westinghouse Machine Company, Cleveland; Julian Roe, Crocker-Wheeler Company, Chicago; E. Friedlaender, Edgar Thomson Works, Carnegie Steel Company, Braddock, Pa.; F. W. McKee, Aliquippa Works, Jones & Laughlin Steel Company, Woodlawn, Pa.; B. G. Beck, American Sheet & Tin Plate Company, Gary, Ind.; R. Tschentscher, South Works, Illinois Steel Company, South Chicago, Ill.; G. W. Richardson, American Bridge Company, Pencoyd Works, Philadelphia; F. H. Kittredge, Illinois Steel Company, Joliet, Ill.; F. A. Wiley, Wisconsin Steel Company, South Chicago, Ill.

The Association of Iron and Steel Electrical Engineers, although a young body in point of years of organization, has become one of the most influential and useful in the iron and steel industry. The organization of the proposed Safety Association through its instrumentality will be a decided triumph for so recently formed a society.

B. R. Shover, of the engineering staff of the Carnegie Steel Company, is president of the organization; James Farrington, of the LaBelle Iron Works, Steubenville, Ohio, is secretary.

Fort Worth Purchases Power for Municipal Purposes.

Having maintained a municipal lighting plant for some time, the City of Fort Worth (Tex.), on July 31, decided to abandon this plant and purchase power from the Fort Worth Power & Light Company. The result of this move is very gratifying to the citizens, as the saving in the cost of central-station energy has made possible the installation of practically double the former lighting equipment.

A report of John F. Grant, light commissioner of the city, showing the results obtained, is presented herewith:

COMPARATIVE STATEMENT OF THE LIGHTING OF THE CITY OF FORT WORTH FOR SEVEN MONTHS OF 1911 AND 1912.

Current used in City Hall, seven months in 1911	$1,149.24
Holly Water Works Plant, amount of electricity used in 1911	1,148.14
Street Lighting, first four months of 1911	7,412.40
Total	$9,709.78
Current used in City Hall, seven months in 1912	$ 796.97
Amount of electricity used at Holly Water Works Plant in 1912	417.93
Street Lighting, first four months of 1912	6,695.86
Total	$7,910.76
Total amount of money expended for electric current in lighting the City for seven months of 1911, was	$14,497.01
against seven months of 1912	14,728.75

There was in use in 1911, 446 arcs and 500 incandescent lights, making a total of 946 lights in the city, and in 1912 there were 700 arcs and 1,150 60-watt Mazda lamps, making twice as many lights in use in 1912 as there were in 1911 with 75 per cent more illumination, and the cost for the entire electric current in the city for 1912 is $238.25 more than the entire amount used in 1911, with the above showing that there are twice as many lights in use with a much greater candlepower per light.

Hydroelectric Plant Proposed Near Pittsburgh.

Pittsburgh capitalists have decided to go ahead with a scheme for a gigantic hydroelectric power plant, involving an expenditure of about $15,000,000. The site is 50 miles from Pittsburgh in the Clarion River. The plant, it is stated, will generate 200,000 horsepower. The work is to be started as soon as the weather breaks next spring. Two dams are to be erected in the river, one at its mouth and the other about 35 miles up stream. The first dam is to be 259 feet high and 1,200 feet across.

At a point where the first artificial lake ends, the other dam will be constructed. This dam will be 265 feet high and about 1,400 feet wide. This will dam the waters of the river back for about 40 miles. An idea of the immense size of the reservoirs can be

had when the statement that it would take from eight to nine months to fill either, is considered. The two dams will flood about 25,000 acres of land. This land is to be optioned and purchased soon. When completed the artificial lakes are expected to form a nucleus for one of the finest summer resorts in western Pennsylvania. A long-distance transmission line, it is reported, will convey the electric energy to Pittsburgh.

New Wireless Circular.

A circular issued on September 2 by the Marconi Wireless Telegraph Company, London, England, indicates that important developments are proceeding in the Pacific.

The company is erecting at San Francisco and Honolulu stations of the same type as those which it is proposed to construct for the British Imperial scheme. The station at Honolulu has been so designed as to enable wireless communication to be established at a little later date with similar stations to be erected by the Marconi Company at Yokohama and in the Philippine Islands. In reference to reports of long distance wireless communications across the Pacific, which the Federal Wireless Telegraph Company claims to have established by means of the Poulsen system, it is stated that the Marconi Company has commenced proceedings for infringement of patent against the Federal Wireless Telegraph Company. No doubt a good deal of information will attach to the contest, and its result will be awaited with interest.

Electric Vehicles in Central-Station-Service.

The Byllesby utility properties now own and operate 22 electric trucks in their own service in cities located in various climates, ranging from San Diego, Cal., on the south to Grand Forks, N. D., on the north. There are at present in service at these properties nine 700-pound trucks, six 1,000-pound trucks and seven 3,000-pound trucks. Their experience with this medium of urban transportation has been very satisfactory, and during the present year additional vehicles will doubtless be purchased.

Meeting of Pittsburgh Boosters.

The first fall dinner and meeting of the Electrical Boosters' Association was held in the Seventh Avenue Hotel on the evening of September 16. Master Controller George Provo presided. The reports of several committees were received, showing the work to be well under way. and $100 was voted for the Sons of Jove convention, which will be held in Pittsburgh on October 14 and 15.

Convention of the Illuminating Engineering Society.

The sixth annual convention of the Illuminating Engineering Society was held at the Clifton Hotel, Niagara Falls, Canada, on September 16 to 19. Except for the convention at Baltimore, it was the first convention to be held outside of a section center, and considering this fact the attendance was very good. The registration up to noon on Tuesday was 145, of whom 22 were ladies.

The first session was called to order on Monday morning by President Van Rensselaer Lansingh, who introduced O. E. Dores, president of the Board of Trade of Niagara Falls, Ont. Mr. Dores made an address of welcome, and was followed by G. F. Nye, president of the Board of Trade, of Niagara Falls, N. Y., who also welcomed the visitors to the twin cities. William J. Sewill made an appropriate response on behalf of the Society.

President Lansingh then made an address on "The Value of Illuminating Engineering to Society," in which he pointed out the modern social and industrial developments which have affected the use of the human eye, and discussed the hygienic, industrial and esthetic advantages of proper illumination.

The report of the Committee on Progress was in the absence of the chairman, presented by George S. Barrows. It summarized the developments of the past year, and was discussed by D. McFarlan Moore, Clayton W. Sharp, H. E. Ives, E. L. Elliott, A. J. Marshall, Charles Deshler, G. H. Stickney, Mr. Stark and C. O. Bond.

The report of the Committee on Nomenclature and Standards was presented by Clayton H. Sharp. This discussed the status of present international negotiations and presented some additional tentative definitions to those proposed two years ago. The report was discussed by H. E. Ives and P. S. Millar.

At the afternoon session R. F. Pierce presented a paper entitled "The Deterioration of Gas-Lighting Units in Service." This was discussed by C. O. Bond, Ralph Seman and Ward Harrison. A symposium on high-pressure gas lighting followed. George S. Barrows read communications from F. W. Goodenough, discussing conditions in Great Britain, and from Oscar Klatte, dealing with progress in Germany. R. N. Zeek discussed conditions in the United States. The discussion was participated in by Messrs. Serrill, Halvorsen, Marshall, Magdsick, Barrows, Elliott, Hussey, Owens, Pierce and George.

A. J. Sweet then gave an account of the work which has been done by the Baltimore & Ohio Railroad, with cooperation of manufacturers, on the illumination of postal cars used in the railway mail service. An aluminized reflector was found to give the best results and 2.5 foot-candles on the work was found to be the minimum illumination which could be called sufficient, while over 3 was required by most of the observers, to be classed as "ample."

The scheduled paper by C. P. Steinmetz was not presented.

On Monday evening a reception and dance was held in the ball-room of the Clifton Hotel. Other entertainment features of the convention were a banquet on Tuesday evening, a trip through the Niagara gorge on Wednesday afternoon, trips by small parties on *The Maid of the Mist*, an automobile trip around Buffalo on Thursday afternoon, and various automobile trips and card parties for the ladies.

At the session on Tuesday morning E. P. Hyde read a paper on "The Methods of Research." This was discussed by C. W. Sharp, H. E. Ives, P. S. Millar, D. M. Moore and E. L. Elliott.

H. E. Ives then presented his paper on "Heterochromatic Photometry and the Primary Standard of Light." Discussion by Messrs. Hussey, Gage and Cady followed.

Secretary Millar presented two reports from the Finance Committee and the Committee on Revenue. The recommendations made were laid over for discussion at the session on Wednesday evening.

Lloyd Jones then presented a paper by P. G. Nutting entitled "A New Method and an Instrument for Determining the Reflecting Power of Opaque Bodies." This was discussed by C. O. Bond and Mr. Lewinson.

The final paper of the session was by M. Luckiesh and was entitled, "A Study of Natural and Artificial Light Distribution in Interiors." This was discussed by J. R. Cravath, A. J. Sweet and F. A. Vaughn.

Arthur Williams, newly elected president of the Association of Edison Illuminating Companies, who had just arrived at the convention was then called upon for an address.

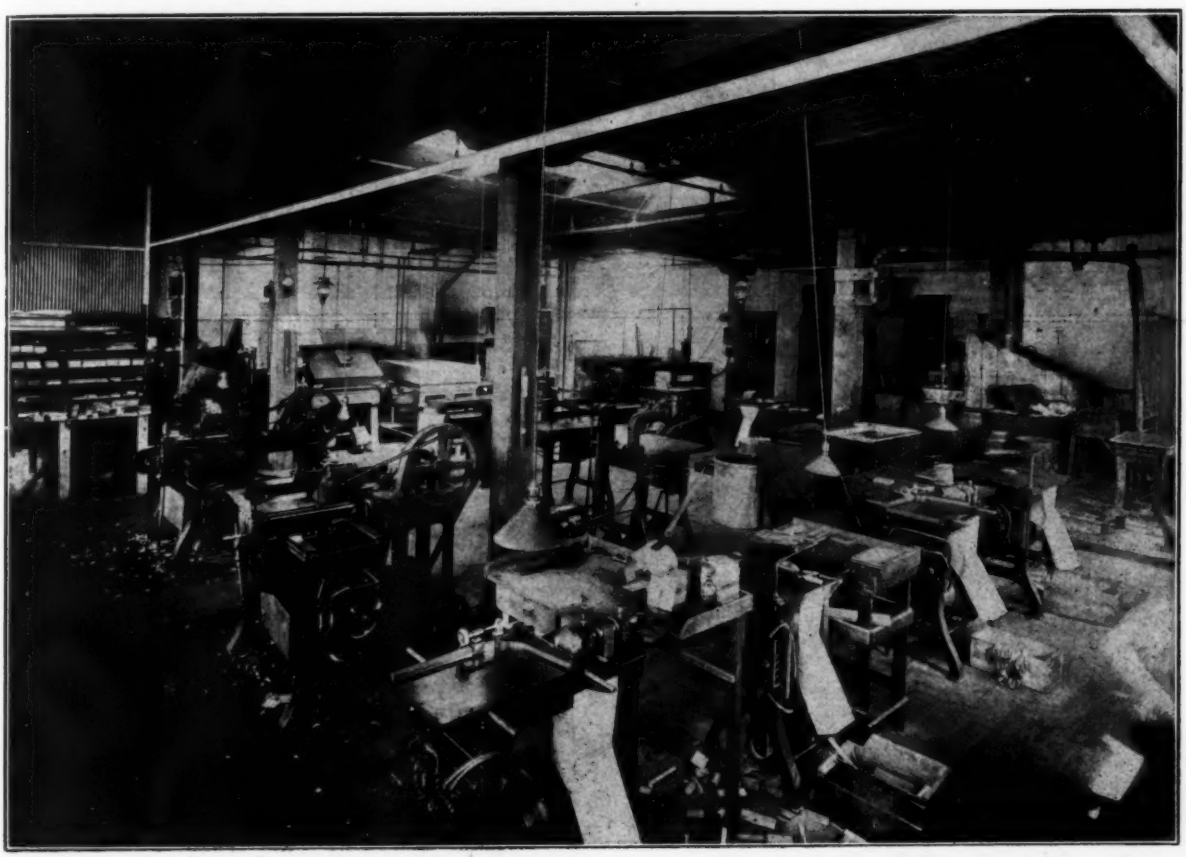
The chairman then asked L. B. Marks to tell of the work of the committee which has prepared the illumination primer. Mr. Marks outlined the difficulties of the committee in meeting the ideas of the various persons whose criticism was invited, and told of the immense amount of work involved in the final preparation.

A detailed report of the papers and discussions will be found in the next issue.

Electricity in Engraving and Electrotyping Plants

This article discusses particularly the advantages of individual motor drive in the engraving and electrotyping industry pointing out the saving that is effected by this method of operation. Operating conditions in typical plants are tabulated in the data sheet.

The advantages of individual motor drive are nowhere so forcibly brought to the attention of manufacturers as in engraving and electrotyping plants. In this industry the central-station salesman is not usually confronted with competition from isolated plants but must devote his entire energies to convincing the prospect of the superior operating conditions in a plant equipped with individual motors. So rapid has been the advancement in this respect that manufacturers of engravers and electrotypers machines have practically discontinued the manufacture of machines adaptable for line-shaft drive only, devoting their entire energies to the production of self-contained individual - motor - driven equipment. It is a significant fact that one of the largest companies in this field has only motor-driven machines listed in its catalog.



General View of a Motor-Driven Plant, Showing Absence of Belts and Shafting.

The arguments in favor of individual motor drive are numerous, but most of them can be classified under the following heads:

(1) Ease and economy of electric-power transmission.

(2) Flexibility of location of machines in the building.

(3) Accessibility of motor-driven machines.

(4) Wide choice of motors as to size, mechanical design and operating characteristics.

(5) Perfect control, including readiness of starting, stopping and making speed adjustment. Ability to control motors from a distance.

(6) Economy of power and time.

(7) Ability to operate any portion of a shop at any time with power consumption proportional to work done.

(8) Reduced hazard of fire and accident.

(9) Readiness with which tests and records can be made.

Industrial work generally requires the application of power at distributed points. No form of prime mover is available which can economically develop power in small quantities at the points of application. The electric motor furnishes the nearest approach to this condition in that electric energy can be economically transmitted and transferred into mechanical energy at the point of application in any quantity desired. When compared with line shafting and belts, the installation of wires for carrying electric current is a very simple and inexpensive operation; in comparing the relative losses in transmission the electrical losses seem almost insignificant.

With electric drive the location of buildings and of the individual machines in a shop is practically unhampered by considerations of power. Buildings can be placed with reference to good labor and transportation facilities, convenience with reference to each other, safety from fires or other disasters, etc., in any case electric en-

ergy is easily brought to the required location, the necessary wires being easily installed in space not valuable for other purposes. The machines in a shop can be placed so as to require minimum handling of material and to obtain most economical production; also, better light and ventilation can be given proper consideration. No matter how remote or inaccessible the corner in which the work is to be done, the motor-driven machine can fill the requirements.

The flexibility extends to the rearrangement of machines to conform to changing manufacturing requirements. A motor-driven machine can be moved from one location to another as a unit without disturbing or interrupting any other machines. The only changes required on account of the power supply are the disconnection of the electric conductors in the old location and their reconnection after the machine is moved. This process is extremely simple compared with that of relocating line shafts and belts. The best arrangement for maximum productive economy can thus be maintained, under changing manufacturing conditions. In fact, many machine tool operations are best performed by transporting the tool to the work instead of the work to the tool; portable tools for such purposes are practically impossible except with motor drive.

Additions to plants employing motor-driven machines and central-station service require very little consideration on account of power, other than the wiring. The station is nearly always prepared to supply the additional power as soon as the manufacturer secures the machines and the necessary floor space. The latter can frequently be provided by rearranging the other machines.

Motor-Driven Saw and Router.

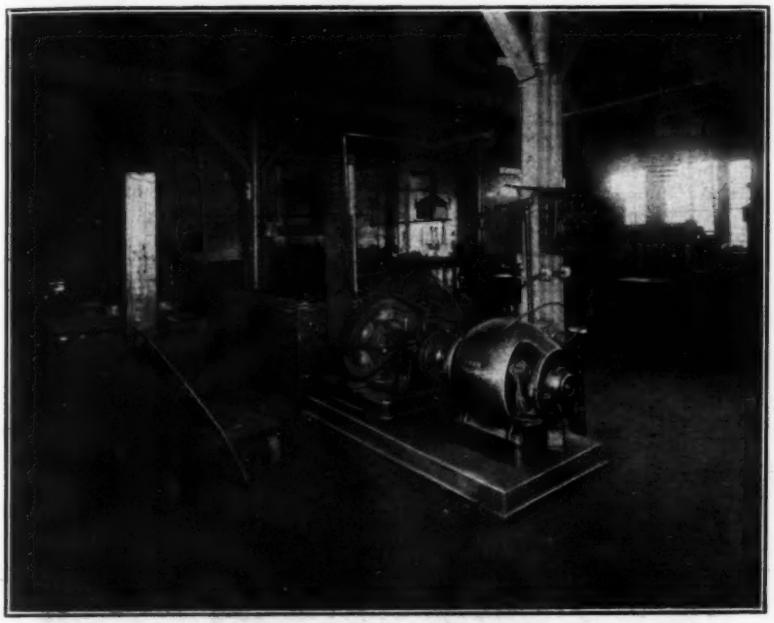
With motor drive the machines become more accessible and the operators are unhampered by the close proximity of countershafts and overhead belts. The freer head room permits easier handling and storage of material, besides improving the lighting.

Electric motors are standardized in sizes, shapes, and with operating characteristics suitable for almost every conceivable application. A motor selection for any given application can nearly always be made from standard products, but the principles of design are so well known that a motor with special mechanical or electrical features can be developed with practical certainty of meeting any special set of conditions.

Individual-Motor-Driven Engraving Plant.

By the use of a motor for each machine any machine can be shut down

when not in use, thus stopping all wear and loss of power in friction. This is not the case with the line-shaft drive, as the wear and the friction losses in each group totally independent of all other groups. Hence in the case of over-time work, only the machinery required need be operated.



Motor-Driven Plating Dynamo.

the shafting are only slightly less when all the belts are on their loose pulleys than when all the machines are working. This possibility of saving power with motor drive is an argument for the use of individual motors on the various machines or groups of machines. Each machine thus driven is an independent unit; group drive makes

Speed adjustment with motor drive is a simple matter, and a motor can be selected such that the speed at any adjustment will be practically constant at all loads. This feature enables a machine to be operated always at the most economical speed. A simple movement of a controller handle at any convenient point near or remote from the motor, changes the speed instantly, and the number of possible speeds can be made as large as desired. Moreover these conditions remain the same during years of service. With mechanical transmission the number of speeds is comparatively small and the speed increments large; moreover, the change of speed is troublesome, and workmen are often tempted to operate with uneconomical speed rather than change it.

Motor-Accelerated Etching Pans.

A motor-driven machine consumes energy only while operating, and then only in proportion to the work done. Electric motors are very efficient machines in all sizes and at all loads within the ordinary working range, which is more than can be said of any small prime mover. The use of motors moreover eliminates some or all the losses due to friction of line shafts and belts. These losses consume anywhere from 30 to 60 per cent of the energy required to operate an ordinary shaft-driven shop or mill, and they are continuous, even though only a few of of the machines are operating. Very few machines are in actual service more than half of the time, the cessation of all energy losses chargeable to each machine, except while it is in productive operation, constitutes a very large saving in power.

With properly installed motor drive, time may be saved in making speed adjustments as well as when adjusting work in a machine tool, or when making ready on a printing press. Time may be saved by running the press more nearly at the correct speed than is possible with belt drive, and in providing power without loss of speed through slipping belts. No time is lost due to accidents to other machines, as each machine is an independent unit. This saving of time increases the output and reduces the cost per unit of finished product.

The economy in time applies alike to the operator and the machine, and the time of the latter is often more valuable than that of the former. For example, the machine must be charged with an equitable portion of interest, taxes and depreciation of buildings and accessories, interest and depreciation on its own value, repairs, renewals, general operating expenses, salaries, cost of power, etc.—all constituting what may be called a machine-hour rate. With large machine tools this rate has been found to be from 50 cents to nearly $5.00 per hour, depending on the tool. Taking the minimum rate and assuming that the workman rceives 35 cents per hour, the combined rate is 85 cents per hour, enough to make it well worth while to operate at full capacity as much as possible. On account of putting in

and taking out work, making adjustments, etc., such a tool can very seldom be in actual operation more than one-third of the working time, which makes its cutting time worth at least $1.50 per hour, or a total for the machine and the operator of $1.85 per hour. If several different speeds are desirable, they can be readily obtained with an adjustable speed motor, and the machine speed can be maintained at the most efficient rate.

The output can thus be made from 20 to 25 per cent greater than with a belt and cone pulleys. That is, if the machine earns $1.85 per hour when belt driven it will earn about 40 cents per hour additional when motor driven, or more than enough additional to pay the operator.

Overtime work with motor-driven machines is much more economical than with shaft and belt drive. With motor drive, power is required but very little in excess of the work being done, overtime work with any given machine being no more expensive than during regular hours. With line-shaft drive, the losses are nearly as great when only one machine is running as when all are running; the power thus lost is usually much greater than the power applied to useful work.

Accidents are far less likely to happen with motor drive than with mechanical drive. Complicated belting is always a source of danger to operators and to the machinery; clothing or limbs are caught in moving belts, resulting in severe injury or a violent death; belts break or become entangled in the machines resulting in serious accidents and damage. Motor-driven machines can be easily arranged to be practically free from such dangers.

The uniform rotative movement of motors permits their successful use in buildings which would not be strong enough to withstand the jar and vibration caused by long line shafts, which are seldom in perfect alinement. On account of the elimination of belt towers or raceways, heavy supports for line shafts, etc., the expense of building structure can be less with motor-driven machines than with mechanical drive. If shafts are employed with motors for group drive they can be comparatively short and light, each driving only a few machines.

One of the greatest advantages of electric drive is the readiness with which the performance of each machine can be recorded and checked. Electric-measuring instruments will reveal with absolute certainty the conditions under which a motor is operating. A suitable graphic meter will also make a faithful record of these conditions, showing just when the motor started, how long and at what loads it operated, when it stopped, etc. Such a meter can be mounted in the superintendent's office and circuits arranged so that it can be connected at will with any machine in the shop, thus giving a means of telling at any time, day or night, what any machine is doing. When connected to a given machine the meter will reveal unnecessary delay in starting, undue haste in stopping before quitting time, or tendency meanwhile to dilatory work or to overloading. Delays which ordinarily would remain undiscovered, such as waiting for materials, copy, drawings, tools, etc., are thereby brought into prominence, and steps can be taken to eliminate many of them.

Equipping a new industrial plant with any other drive than electric motors is a very rare occurrence. The saving in cost of building construction will partly offset the additional cost of motor drive; the saving in cost of power, in insurance premiums, in time required for any given process, and inconvenience, if properly capitalized and balanced against first cost of installation, will invariable largely favor motor drive.

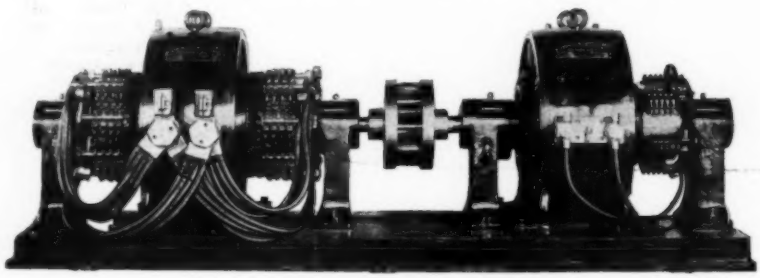
The change of existing plants from mechanical to electric drive will also, in nearly every case, give results favorable to the latter. As an example, the total operating cost of a machine including the machine-hour rate and labor charge is 85 cents per hour, or $2,387 per year (2,808 hours). Assuming that the machine with mechanical drive earns $2,500 per year, it will earn at least 20 per cent more, or $500 additional, with motor drive. With interest and depreciation at 16 per cent, $500 represents a capitalization of $3,125; that is, this amount could be added to the investment without changing the net profit. As a matter of fact, such a tool can be equipped with motor drive at a cost not exceeding $500 complete, which would be returned in one year's increased earnings.

That individual motor-driven machinery is replacing the single-motor system is shown particularly in the plant of the Sampson-Ollier Company, where lower power bills, more floor space and convenience and cleanliness have resulted from the change to the more modern method of operation. Views of this plant are shown in some of the accompanying illustrations.

The natural light in this plant is excellent. The machines are all driven by individual motors, in nearly every case mounted on the machines, either belted, or in a few cases, direct-connected, so that there are no overhead belts. The wiring is carried through conduits, and the general appearance of the shop is particularly clean and attractive.

A 220-volt Commonwealth Edison three-wire direct-current circuit from the Ohio Street substation supplies the plant with power.

In the processes used in producing electrotypes, the first machine used is the wax shaver, a machine into which the wax plates are placed to be shaved smooth and even, after the wax, in its natural form, has been melted and run out, to the thickness of about one-sixth of an inch, on metal plates. The cutter has a reciprocatory motion, cutting the wax material in going forward and passing over it freely in reversing. A one-horsepower compound-wound reversible motor, running at a speed of 1,200 revolutions per minute, is used to operate this machine. A motor starter equipped with special attachments for inserting dynamic resistance across the armature of the motor is usually used for quick stopping.



Roth Motor-Generator for Electrotyping.

After the wax plate is trimmed it is ready for the molding press. This is a powerful hydraulic machine capable of a pressure of 800 tons, if necessary, obtained through a motor-driven triplex oil pump. The type matter sinks into the wax, under this pressure, and an absolutely perfect impression is obtained. The plant under consideration is equipped with two of these molding presses. One is a 24 by 30 and is driven by a two-horsepower shunt-wound motor, running at 1,100 revolutions per minute. In this press the motor is geared to the pump. The other machine is a 32 by 25 and is driven by a three-horsepower shunt-wound motor belt-connected to the pump.

(*Continued on page 540.*)

Engraving and Electrotyping Data.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Electrotyping plant, located in Chicago, name withheld. Individual drive. Running hours per week, 60. Total connected horsepower, 36.75. Total number of motors installed, 16. Average kilowatt-hours per month, 1,723. Average kilowatt-hours per month per horsepower connected, 47.87.

Kilowatt-hour consumption for 12 months: January, 1,327; February, 3,033; March, 2,989; April, 2,740; May, 1,301; June, 836; July, 550; August 700; September, 1,090; October, 1,320; November, 2,473; December, 2,322. Load-factor, 10.2 per cent. Operating-time load-factor, 17 per cent.

MOTOR INSTALLATION.

The supply source is 220-volts direct current. All motors except the one indicated are shunt wound.

No.	Horse-power.	Speed R.P.M.	Application.
1	1	1,200	Compound-wound motor belted direct to an Ostrander-Seymour wax shaver.
1	2	1,100	Belted direct to one molding press.
1	3	1,825	Belted direct to one molding press.
1	1.5	850	Belted direct to one black leader.
1	20	575	Direct-connected to a plating dynamo.
1	0.75	2,600	Direct-connected to one Ostrander-Seymour backing pan.
1	2	1,100	Belted direct to one rougher.
1	2	1,100	Belted direct to one power shaver.
1	1.5	1,800	Belted direct to one saw.
1	0.75	2,350	Belted direct to one trimmer.
1	0.75	2,350	Belted direct to one vertical router.
1	2	1,100	Belted direct to one Daniels planer.
1	2	1,100	Belted direct to one Ti Pi planer.
1	0.5	1,075	Belted direct to one agitator.
1	0.5	525	Belted direct to one combination jig saw and drill.
1	0.5	1,075	Direct-connected to grinder.

Engraving plant, located in Chicago, name withheld. Individual drive. Running hours per week, 60. Total connected horsepower, 9.5. Number of motors, 9. Average kilowatt-hours per month, 935.

Kilowatt-hour consumption for 12 months: January, 1,174; February, 1,194; March, 1,249; April, 1,100; May, 560; June, 646; July, 548; August, 662; September, 921; October, 941; November, 1,040; December, 1,174. Load-factor, 20 per cent.

MOTOR INSTALLATION.

The supply source is 220 volts, direct current.

No.	Horse-power.	Speed, R. P. M.	Application.
1	3	1,600	Direct-connected to a Daniels planer.
1	2	750	Belted direct to a Tipi machine.
1	0.5	700	Direct-connected to a combination jig saw and drill.
1	0.5	1,700	Belted direct to a trimmer.
1	0.5	2,175	Belted direct to a beveler.
1	1	1,750	Belted direct to one metal saw.
1	1.25	2,200	Belted direct to one routing machine.
1	0.25	.....	Direct-connected to grinder.
1	0.5	900	Geared to etching tub.

Electrotyping and engraving plant. Individual drive. Running hours per week, 60. Total connected horsepower, 42.25. Number of motors, 24. Average kilowatt-hours per month, 1,574.

Kilowatt-hour consumption for 12 months: January, 1,883; February, 1,578; March, 2,111; April, 1,875; May, 1,757; June, 1,970; July, 1,324; August, 1,380; September, 1,076; October, 1,211; November, 1,330; December, 1,390. Load-factor, 6.5 per cent.

MOTOR INSTALLATION.

The supply source is 220 volts, direct current.

No.	Horse-power.	Speed, R. P. M.	Application.
1	3	1,050	Belted direct to one Lloyd press.
1	0.5	1,600	Belted direct to one wax shaver.
1	1.5	850	Belted direct to one Ostrander Seymour six-brush black leader.
1	3	1,050	Belted direct to one wet lead tank.
1	1	1,750	Belted direct to one C. B. Cottrell curved plate saw.
1	2	1,750	Belted direct to one metal saw.
1	2	1,750	Belted direct to one wood saw.
1	1	1,750	Belted direct to one small wood saw.
1	0.5	1,600	Belted direct to one jig saw and drill.
1	0.5	1,600	Belted direct to one horizontal beveler.
1	0.5	1,600	Belted direct to one vertical beveler.
1	1	1,700	Belted direct to one trimmer.
1	0.75	2,300	Belted direct to one Lloyd flat router.
1	0.75	2,300	Belted direct to one Lloyd curved router.
1	2	1,750	Belted direct to one Ti Pi planer.
1	2	1,100	Belted direct to one flat rougher.
1	2	1,100	Belted direct to one curved rougher.
1	2	1,100	Belted direct to one metal shaver.
1	2	1,750	Belted direct to one dovetailer.
1	2	1,100	Belted direct to one Daniels planer.
1	0.25	1,700	Belted direct to one bench drill.
1	0.5	1,600	Direct-connected to emery wheel.
1	5	900	Direct-connected to Eddy plating dynamo.
1	12	400	Direct-connected to Lloyd four-pole plating dynamo.

This motor has a speed of 1,825 revolutions per minute. The pump in this press is built in the base and runs constantly in oil, the oil being used also as the medium for conveying pressure to the plunger.

After obtaining the pressure desired in the wax plate, it is then ready for the polishing machine. This machine, frequently called a black-leader, is used for coating the wax with black lead. It is equipped with six large soft badger's hair brushes, moving rapidly up and down by reason of being mounted on eccentric rods. These brushes work the black lead into and polish the smallest indentations, the plates being carried back and forth under these brushes on a slowly moving bed. A one and one-half horsepower shunt-wound belt-connected motor is used for driving this machine, the motor being mounted as an integral part.

After some minor operations to prepare the wax matrices for the electroplating bath, they are thoroughly washed, a positive pump being used to give increased pressure to the water. This pump is driven by a one horsepower shunt-wound belt-connected motor.

The plating dynamo in this plant is an Ostrander-Seymour 2,000-ampere compound-wound six-volt electroplating machine. It is mounted on an iron bed plate and coupled direct to a 20-horsepower Roth motor. The motor and generator are insulated from each other on the base, and an insulating coupling is used which is of a flexible type. To prevent what is known as burning and to secure an absolutely even deposit on all portions of all plates, the plating solution is constantly agitated by air which is pumped into it through perforated lead piping. This pump is gear-driven by a one-fifth horsepower motor running at a speed of 1,075 revolutions per minute.

The plate is removed from the bath after a thin shell of copper has been deposited, washed with acid, and a sheet of tin foil placed over it. It is then taken to a cooling table, and after being backed with melted lead, is cooled by a motor-driven blower. This blower is mounted under the cooling table, two air outlets being provided from the blower piping.

The complete cast is then taken to the roughing machine. This machine, which cleans the backs of the metal plates before they are mounted on wood, is driven by a two-horsepower motor running at 1,100 revolutions per minute, which is mounted directly on the machine and geared to it. The power shaver directly driven by a two-horsepower motor planes the plates to the required thickness and they are then ready to be mounted on wood blocks.

There are numerous other machines used in this establishment for sawing, trimming, planing and routing both wood and metal. The saws are driven by one and one-half-horsepower shunt-wound motors with a speed of 1,800 revolutions per minute. The motors are mounted under the machines on brackets and belted up through the frame of the machine. Idlers are provided for maintaining a proper belt tension. The trimmers are similar in their design to the saws, and are driven by three-quarter-horsepower shunt-wound motors running at 2,350 revolutions per minute. These motors are also provided with idlers. A two-horsepower, shunt-wound motor of the vertical type, having pulley down, is used for driving a Daniels wood planer. This machine has a revolving head fitted with two tools mounted on a vertical shaft and is used for planing the wood blocks to a certain thickness before the plates are mounted thereon. The routers, machines for routing out or removing certain portions of the plate, are also driven by motors of the vertical type, these being, in this case, three-quarter-horsepower machines having a speed of 2,350 revolutions per minute. The routing machines themselves run at a speed of 15,000 revolutions per minute.

The nature of this business is such as to produce a great amount of dust and dirt, and it is therefore necessary to have all motors of the inclosed type when exposed to the dirt.

Commercial Practice
Management, Rates, New Business

PURCHASED POWER—ITS ADVANTAGES VERSUS ITS COST.[1]

By A. E. Rickards.

The object of this paper is twofold: *First.* To show the power companies that central-station service can be sold to the manufacturers, on the basis of the advantages it offers, rather than the cost of power. *Second.* To show the power companies the advantage of marketing their product on this basis. In marketing your product on the advantages to be gained by its use, instead of on its cost, you can sell your service to the largest manufacturers, and your customers will be satisfied ones.

The main reason why your service should be sold upon its advantages, lies in the fact that the manufacturer's power represents but a small portion of his gross expense, ofttimes less than one per cent and rarely exceeding three per cent, even with the large power consumers. Consequently if you were able to save him 50 per cent on his cost of power, it would not increase his net profit one per cent.

Then why bring up this minor detail of power cost, when by exploiting the advantages of purchased power you can make it become a subject of the utmost importance to him. If you were to state to a manufacturer that you could show him how your service would increase his net profit 50 per cent, do you not think he would sit up and take notice?

I will explain later how central-station service in a nut and bolt factory increased the production and how this increased production increased their net profit 60 per cent.

The board of directors have turned over the factory to the manager, to get results in the shape of dividends, and if he does not produce the goods he certainly cannot hold his job very long. The problem that is constantly before him is "Selling Price Minus Cost of Production Equals Net Profit." His principal object in life is to keep the selling price and the cost of production as far apart as possible. Competition is keen, it usually increases faster than the demand; this drives down the selling price, while the increased cost of labor and the constant increase in the price of raw materials, increases the cost of manufacture, and he knows that the cost is destined to go still higher.

The live manufacturer of today knows that an increase of profits can only be obtained through an increase in the efficiency of his plant. If you can convince him that your service will help him solve this problem, he will welcome you like a long lost brother. Your service will increase production, and a slight increase in the output means a material increase in the net profits. There are many cases where central-station service has increased the production 50 to 60 per cent. So why not talk the effect of increased production upon the net profits, instead of power costs?

[1]From a paper presented before the recent Pennsylvania Electric Association convention.

Your prospective customers naturally divide themselves into three classes as follows: *First.* New industries. *Second.* Those using electricity furnished by an isolated power plant. *Third.* Those using a steam or gas engine plant driving their machinery by line shafts and belts.

Let us treat them in the above order.

Every new industry should be a user of central-station service, and it will be if the proposition is put up to it in the right manner.

Inasmuch as a prospect of this kind is planning to build a power plant, your fight is to keep him from building it, and the negotiation must be conducted upon the basis of the cost of power and the possible saving upon the initial investment. As the factory is not built the advantages of central-station service must be based upon carefully made estimates.

The manufacturer should be shown what the following details would be with an isolated plant, and what they would be with your service:

(*a*) The investment for the necessary equipment, and the effect of investing this amount of money in a way that will directly affect production.

(*b*) The total number of kilowatt-hours required per annum.

(*c*) The cost per kilowatt-hour.

A proper study will show up the above, together with many other advantages in favor of purchased power. To illustrate this more forcibly, it will probably be opportune to show the result of an investigation made for a railroad company, about to build a new coal pier at its terminal, for unloading coal from the cars into ships.

As this pier is planned, it extends from the shore, serving vessels on both sides, with chutes from coal pockets. Two tracks extend the length of the pier over the coal pockets, and on these tracks are operated electric transfer cars. At the shore end slightly above ground level are located two car dumpers. The two sides of the pier are alike and independent of each other, each having its own dumper, transfer cars, etc.; with one exception which will be noted later.

The cycle of operation is as follows: A mule car, which runs from the car dumper under the loaded coal cars, couples onto a car and pushes it onto the platten of the dumper; the car is then moved sideways against the dumping cradle and after being securely clamped is dumped; it dumps into the transfer cars which are at the side of the dumper and on a lower level.

The transfer car then proceeds to the elevators located at the end of the pier which take it to the tracks on top of the pockets; after discharging their load they proceed to the outer end of the pier from whence they are switched back to the dumper by gravity. This switch back is a single track and is the only part of the equipment which is common to both installations. This has the effect of making the two sides of the pier alternate in their cycles and prevents both doing the same thing at the same time.

As soon as a car is dumped, the mule brings another loaded car up to the dumper, which pushes the empty car off the platten. The empty car pursues its way by gravity to a kick-back to the yard track. There are several transfer cars on each side of the pier, so there is no halt in the operations.

An analysis was made to determine the advisability of using central-station service or installing their own power plant.

The investment necessary for an isolated plant was $160,400, while that for a substation was only $36,400, a difference of $124,000 to be used for other purposes. At this point it is interesting to observe what it would mean to invest this sum of $124,000 in rolling stock.

Taking the cost of a 50-ton steel car at $1,240, the above amount of money would purchase 100 cars.

Assuming each car to make one trip per month and taking the freight rate at $1.50 per ton, each car would earn a revenue of $75 per month, or $900 per year. Then 100 cars would return revenue of $90,000 per year.

After being shown the advantage of investing this money in rolling stock instead of in a power plant, which would only add to their burden charge, the management decided to use purchased power provided the cost would be no greater.

To secure contracts from the manufacturer who is now operating his factory by electricity furnished by an isolated power plant is some job. The manufacturer believes that inasmuch as he is now using electric power, he has all the advantages of electric drive, and furthermore than he is generating power just as cheaply as you can.

A correct analysis of the cost of his power per kilowatt-hour will show that his costs are greater than the rate you quoted, provided that your rates are at all equitable.

An investigation will also almost invariably show that he is not getting the maximum output possible with electric drive, due to the incorrect application and arrangement of motors.

The manufacturer who knows his cost of power per unit generated is a rare one. It is seldom that they have integrating meters to measure the current generated, and again they often use steam in their process of manufacture. In a factory of this kind the cost of the live steam and the cost of the electric power per unit generated should be shown separately.

To illustrate this we will cite the case of a paper-mill owner, who was a large power consumer and also used a large quantity of high-pressure steam in the process of manufacture. The local power company endeavored to sell him service. He had his engineering department work up a report showing the cost of power per unit.

In the report it was shown that he was generating power at 1.4 cents per kilowatt-hour which was slightly lower than the rate quoted by the power company.

The electric company was not satisfied and secured permission to investigate further, and by separating the cost of steam and electric power were able to show that the electric power cost was much higher and the steam cost lower than the manufacturer's estimate.

Most isolated plants are direct current and quite frequently their machinery is all constant speed.

Alternating current is a factor that can sometimes be brought in effectively. The average efficiency of alternating current motors ranging from 0.5 to 75 horsepower is 6.75 per cent higher, than direct-current motors; also the cost of maintenance is 50 per cent less.

The manufacturer, operating his factory with a steam or gas engine, driving the machines by line shafts and belts, affords the best kind of prospect on which to demonstrate how your service will increase net profits by increasing production.

In the sale of power the human element enters very largely and is a factor that should be handled with extreme diplomacy. The manager will take a strong defensive attitude when approached on his cost of power, for the reason that he takes pride in his power plant and feels that his costs are low.

On the other hand, when approached on the subject of shop efficiency he will usually admit that an investigation would show many ways to effect improvements, and generally his only excuse for not taking advantage of the possibilities, is that he is afraid of the expense that would be involved, and the fear that the recommendations would mean costly changes. The only explanation of this attitude is, that during the past few years the trade journals have given considerable publicity to shop efficiency methods, thus educating the manufacturer upon this subject, whereas but little heed has been taken of the use of power and its cost. Why not take advantage of this condition of affairs and sell power upon the advantages your service affords?

Before going further I would like to point out that the method, commonly in vogue, of conducting power sales is wrong.

When opening a negotiation with a manufacturer for the use of central-station service, almost the first question asked will be, "Well, how much is it going to cost me?" "What are your rates?" Many times the solicitor will

name him a rate, and thereafter, he is on the defensive and must show the justification of the rate and has only a slight opportunity to talk the real benefit possible to be had from the service.

After a rate is named the manufacturer goes to his steam engineer and asks him his idea of what he believes his average load to be; if they have a 200-horsepower engine, the engineer will probably advise him that the load averages 175 horsepower throughout the entire working period. The manufacturer then figures out that last year he operated 3,000 hours and therefore must have generated 525,000 horsepower-hours.

He then looks up his fuel bill for the past year, makes a guess at the supplies and repairs, adds the power plant wages and this amount he divides by the number of horsepower-hours generated, and of course he finds that he is generating power much lower than the rate you named.

First of all, he probably did not generate any more than 25 per cent of the amount he figured, and again he utterly ignores the interest on the investment, depreciation, insurance, taxes, water and rental space.

How much better it would be not to name a rate, but to tell him how central-station service has increased the net profit for others and secure his permission to conduct an investigation in his factory, to determine what benefit he would derive. By handling a negotiation in this manner the subject of power cost becomes a detail and when it is also shown that you can effect a saving on this item, you have strengthened your case.

Sell service; by doing so you will eliminate the customer who compares his bill with the same month of the previous year, and then calls up and kicks because he used a greater quantity. If your work is well done the manufacturer will know that the power consumed will be in proportion to his output.

Such men as F. W. Taylor, Harrington Emerson and other noted efficiency engineers have accomplished wonders for the manufacturers, by increasing the human efficiency of the employees. However, their methods deal principally with the individual workman, and they barely touch upon the physical equipment in the factory. These men are the principal advocates of shop methods and systems, and they are in a large measure responsible for the interest the average manufacturer takes in factory economics.

You have just as great an opportunity to show a manufacturer how to increase the factory efficiency as any efficiency engineer, the only difference being that you treat the physical equipment, while they treat the human element. I believe that yours is a stronger card than any they have. For instance, a manufacturer can take great pains during dull periods to build up the human efficiency of his workmen; he can exercise care and take his pick of the applicants for work, and also weed out the inefficient ones in the shop, until the average efficiency of the entire factory is high. However, when business is brisk he cannot be so choice in his labor, and many times has to take what he can get. The new men will not adopt new methods, and they will affect the personnel of the rest of the organization to such an extent that it is only the question of a short time before they gradually slip back to their old methods, and the high efficiency formerly maintained has gone.

If the physical equipment is brought up to its highest efficiency, the better the times, the higher that manufacturer's efficiency will be.

This branch of engineering is really a new field. It directly affects your business and it is now up to the power companies to take up this cause and educate the manufacturers; by doing so, it will be but a few years when the manufacturer making his own power will be the exception instead of the general rule.

Before showing how central-station service can be sold by increasing the physical efficiency of a factory, I wish to point out the immediate need of reducing the cost of production to those industries in which there is a large competition. The bolt and nut industry is partly representative of this class and will be used to illustrate.

The United States census reports show that from 1900 to 1905 the number of companies manufacturing nuts and bolts, etc., increased 22 per cent.

The total capital increased 75 per cent and the total demand for the finished product increased only 5 per cent.

Year	No. of Establishments	Capital per Establishment	Value of Product Per Establishment	Total Output	Per cent capital Based on Production
1900	72	$150,000	$194,000	$13,978,382	77%
1905	88	215,000	167,000	14,687,108	130%

From the above it can be readily seen that competition increased faster than the demand. In fact, the average demand for the finished product per establishment was 13.9 per cent less in 1905 than in 1900, and at the same time the average investment per establishment increased 43 per cent.

Their only hope is in decreasing the cost of manufacture. The conditions shown in the above are not the extreme. An analysis of the machine-shop industry shows similar conditions.

To show you how central-station service was sold to a manufacturer to increase production, I will take an investigation made in a bolt and nut factory as an example, showing how the investigation was made and the results afterward obtained.

This company was using a gas engine, driving the machinery by shafts and belts. The usual tests were made in the engine room to determine the quantity of power generated, friction losses, etc., and the cost per kilowatt-hour.

Then to determine the speed fluctuation throughout the factory and how it affected the output, a graphic tachometer was connected to the main line shafts. It was found that the average fluctuation of speed throughout the entire period was 6 per cent. The output of the driven machines of course varied in a like proportion.

A study was made of the losses due to the up keep and slippage of the belts. It was found that with correct motor applications, 48 belts could be eliminated and by doing so, this alone would increase the output 4.17 per cent.

Frederick Winslow Taylor found after nine years' exhaustive tests, during which time very accurate records were kept of belt renewals, maintenance, etc., that every belt gave an average of twenty-six interruptions to service during its life. On this basis each belt gave five interruptions to manufacture each year.

With the 48 belts, dispensed with in the above, this would equal 240 interruptions to manufacture per year. Assuming that two interruptions are equivalent to a complete rupture in the cycle of manufacture, and that the average time required to repair each belt is one hour, this would equal 120 hours loss to manufacture per year.

The total operating time was 2,880 hours per year; this divided into the loss of 120 hours equals 4.17 per cent.

Studies of the operating and cutting speeds of the individual machines were made. Graphic meters were connected to the machines whenever possible and blue prints of the charts were incorporated in the report, as they are much more convincing than just the statement that so and so is the case. There were 30 machines and not one was operating at its correct cutting speed.

On the nut-tapping machines it was found that by increasing the cutting speed on the machines tapping one and one-quarter inch nuts or larger, that an increase in their output was obtained, while on the machines tapping smaller sizes than one and one-quarter inch, increasing their cutting speed did not increase the output. Time studies were made with a graphic time meter which brought out the solution as explained in the following:

Nut-tapping machines are usually built in gangs of six spindles each. A time study shows that it required a man one minute and five seconds to put his foot upon the lever, raise the tap and place a nut in position. To place nuts

under six spindles took nine seconds, to walk from the last spindle back to the starting point required five seconds, thus fourteen seconds had elapsed. By using the correct cutting speed, it required three seconds to tap a five-eighth inch nut. In other words each spindle ran idle eleven seconds. It is readily seen that one man cannot attend to six spindles and keep each cutting to its capacity. By placing two operators at each machine the output was increased 133 per cent.

Table 1 shows the per cent increased output obtained by operating the threading machines at the correct cutting speed.

TABLE 1.

Number of Machine.	Size of Bolt.	Per Cent of Speed Increase
1	¼	81
2	¼	73
3	⅜	24
4	⅜	33
5	½	49
6	½	19
7	½	65
8	½	30
9	½	34
10	⅝	27
11	⅝	39
12	¾	04
13	¾	26
14	¾	79
15	¾	10
16	¾	91
17	¾	58
18	¾	21
19	⅞	46
20	⅞	71
21	⅞	37
22	⅞	24
23	⅞	32
24	⅞	56
25	1	52
26	1	32
27	1	41
28	1	18
29	1⅛	37
30	1⅛	06

To make a long story short, through the increase obtained in the factory, this manufacturer increased his net profit from $20,000 to $32,000, or in other words, his net profit was increased 60 per cent. Central-station service and proper application of motors produced this result.

You are probably wondering why it should be necessary to go into such a detailed investigation. If a manufacturer attempts to operate all the machines at their maximum output, in almost every case the power required would be so great that their isolated plant would not carry the load.

Then again, by making time studies on the machine operation you will sell more power. It is readily seen in the preceding illustration on tapping nuts that twice the amount of power was sold that would have been if the study had not been made. In the bolt-threading department the additional power required was in proportion to the increase of speed.

Most manufacturers will readily admit that electricity in their factory would be a great improvement, but believe that to secure the advantages would require an extensive power plant. Many of them who have tenaciously clung to line-shaft drive and other out-of-date methods, are finding that they no longer are able to maintain their former profits, due to the competition of those manufacturers who are keeping pace with the times. Year by year they find their profits dwindling and although they realize that improvements are necessary, delay making them on account of the expense involved.

Other manufacturers find that there is a growing demand for their product, and would like to enlarge their factories to take care of the increasing demand, but are holding back because of the large amount of money required; a fair portion of which must be put into additional power house equipment.

To these manufacturers your service offers the solution. With purchased power they can make their changes at a minimum of added expense and but a small per cent of the outlay that would be required with an isolated plant.

The more money a manufacturer ties up in power house equipment, the more difficult it will be to induce him to abandon it and use purchased power. To illustrate how money is spent foolishly in this manner I will cite the case of an occurrence in a cotton mill. This plant was using an 800-horsepower Corliss cross-compound condensing engine. Indicator cards showed that their load averaged 740 horsepower. They were installing a low-pressure turbine to operate from the exhaust steam from the Corliss engine.

When asked if they expected to increase the capacity of the mill, the manager stated that they did not, and that they were installing the additional equipment to help out their engine, which they claim to be heavily overloaded. He was under the impression that the engine was only 650 horsepower and knew they were pulling 750 horsepower. He obtained his information from his steam engineer.

In looking into the matter further it was found that this engine was built for 800 horsepower, instead of 650. In other words this company spent $13,00 foolishly and when operating the turbine the fuel and water consumption will be greater than formerly.

If the power company had investigated the conditions thoroughly before the new equipment was bought, this company would not have made the purchase, and the central station would have placed itself in a position to sell their service.

Features of the Kentucky Electric Company's New Home.

Detailed description of the manner in which the new headquarters of the Kentucky Electric Company, at Fourth Avenue and Chestnut Street in Louisville, Ky., are to be fitted up has been furnished by President Robert E. Hughes, of the Ky-El-Co interests. The central station will spare neither pains nor expense in making its business offices thoroughly up-to-date in every respect and adapted in the best possible fashion to the promulgation of the electrician's slogan.

In the matter of physical make-up, the company's offices and show-rooms will compare favorably with any of similar character in the Middle West. The building is of dark mottled brick with a front entirely of glass and ornamental iron work. It is three stories high and fronts on Fourth Avenue, only a block distant from the intersection of that thoroughfare with Walnut Street, the heart of the retail business district. Tens of thousands of square feet of floor space are afforded.

Four thousand square feet of floor space on the ground floor of the structure, directly adjacent to the Fourth Avenue entrance, is to be devoted to a display room. Here every sort of electric fixture and modern convenience for the home, office or factory will be shown. Two capacious show-windows will be provided, and it is the purpose of the company to install a new electrical display weekly, utilizing a moving device wherever possible. An electric chocolate dipper may appeal to the candy manufacturer one week, while a laundry outfit for the home or for the largest laundry plant in the city may attract attention the next, followed by an electric soldering demonstration for tinners, plumbers, and others, the next.

An electric kitchen and dining-room is to be a permanent feature of the first floor of the office building. Here meals will be electrically cooked and served in a dining-room that is heated, ventilated and cooled to just the right temperature by the same current, for the benefit of office employees of the company and callers. This feature alone promises to create special interest.

In the basement there will be a permanent institution of especial note. "A Matchless Apartment" is to be furnished. Electric lights, sad-irons, cigar lighters, curlers, toasters, ovens, heaters and all other appliances known to the craft will be installed.

The rear of the first floor will be given over to a public telephone room, service furnished free of charge; a stenographic room, an information booth and the offices of the president, the secretary, the treasurer, the cashier, the lighting manager and the power manager.

Educational features designed to increase the consumption of electricity among Falls City manufacturers are to occupy the upper floors of the building. President Hughes is planning a series of moving-picture shows which will be given for the entertainment and instruction of the Louisville Engineers' and Architects' Club, the Merchants' and Manufacturers' Association, the Builders' Exchange and other business organizations.

Electrical Construction

Emergency Lighting in Theaters.

It is customary to require in theaters and similar buildings using electric lights that provision be made for a second source of light in cases of emergency, such as the failure of the primary source. This is frequently accomplished by the use of gas, especially in the older buildings which were already supplied in this manner before the electrical equipment was installed. This is not so satisfactory, however, as a provision of a second supply of electric current from some other source. It is also less safe, since the fire risk is materially reduced by eliminating gas pipes entirely from the building. Lighted gas jets, even when protected, are a source of danger.

In some cases small storage batteries have been provided for each individual lamp used as an emergency light, while in other cases it has been possible to obtain separate service from an independent generating company, or possibly two distinct sources of supply belonging to the same company.

A method which has been adopted in two theaters in Glasgow, Scotland, has been described by John D. Mackenzie in the *Electrician* and the following account is taken from this article. The theaters in question are the Olympia Theater and the Savoy Theater. In both of these cases the method has proven satisfactory and it is intended to follow it in other theaters to be erected in Scotland.

The method adopted is to provide a storage battery capable of supplying all the emergency lighting for some time. The average number of emergency lamps required in a theater varies from about 130 to 150 lamps, and their candlepower from 2.5 to 50 candlepower. The average time of failure of supply in theaters does not usually exceed 30 minutes and is very often much less, and the time required to clear a theater of the audience in an orderly manner without panic is generally only a matter of a very few minutes. Consequently, the problem to be solved is to provide a source of energy coming automatically into operation immediately the main supply fails, and which will be able to supply the demand for a period sufficiently long to meet either or both the above contingencies.

Such a source of energy is at once obtainable with a storage battery, and as the demand made upon it is comparatively light, a small battery can be installed, so long as it is kept charged and provision made for bringing it into circuit immediately upon the failure of supply. Of course, a storage battery is of no use unless it is always kept charged and in good condition, and it will readily be admitted that the whole secret of keeping a battery in good condition depends upon the certainty with which it can be charged and subsequently discharged and charged again in regular definite sequence. Owing to the particular arrangement of the installation in this system this regular sequence must be adhered to, and any failure of the battery will be noted at once. Stated simply, the method is

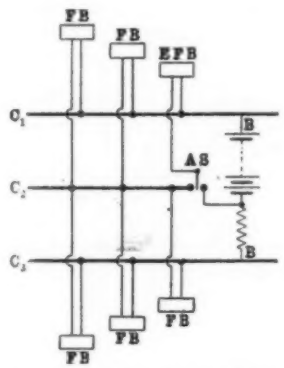


Fig. 1.—Diagram of Connections.

to charge the battery almost every evening during the hours of the performance and to discharge it each day to provide the current necessary for the cleaning lights throughout the theater, the main supply switches being turned off and the only current available during that time being from the battery.

The application of this method to a three-wire direct-current system is illustrated in the diagrams. Fig. 1 gives the general arrangement of the wiring, the lamps being supplied equally from both sides of the system in the usual way. The connections for the battery are indicated at *BB* and those for the emergency lighting fuse board at *EFB*, while *AS* represents the automatic switch. Fig. 2 gives the detailed connections for the battery and emergency lighting. The supply mains are indexed similarly in each figure, namely C_1, C_2 and C_3, respectively.

It will be noted from Fig. 1 that the lighting required for the front of the house is, with one exception, in no way different from recognized practice. The exception is that all the emergency lamps required for cleaning purposes during the day are grouped on one fuse board and this fuse board is connected both with the main supply and with the emergency battery supply. An automatic solenoid-controlled switch, free from all link or trip gear, performs the necessary operation of switching the battery in and out as required. The fact that this switch was entirely free from link gear of all kinds appealed strongly to the inspectors, as it was deemed impossible for it to stick in any way.

Fig. 2 shows how the various connections are made, C_1, C_2, C_3 represent the three-wire system of the supply company, so far as they refer to the emergency system. The two outers C_1, C_3 pass through meters M_1, M_2, as shown: F_1, F_2, F_3 are the three fuses; *MS* is a main double-pole switch and *CMS* is a single-pole charging main switch. *B* represents the storage battery, *AS* the auto-switch having a battery volt-meter and ammeter, *V* and *A*, and the fireman's key switch *KS* incorporated with it; *VR* is a variable resistance to regulate the charging rate of the battery; *ER* are economy resistances in series with *SS*, the switch solenoids; *EFB* is a distributing fuse board from which all the emergency and cleaning lights for the front of the house are controlled.

Following out the connections it will be seen that at *a* on main C_1 a wire is tapped off to supply the solenoids *SS*, the current passing first through the right-hand coil, through its corresponding economy resistance coil *ER*, thence through the left-hand *ER* and *SS* and so back to C_3. Thus, so long as the supply from C_1 to C_3 is intact, the solenoids will be energized immediately the main switch *MS* is closed.

It will be noted that when the auto-switch is down the economy resistances are short-circuited, so as to permit the solenoid to act quickly and pull the switch up into its normal position against the upper set of contacts, b_1, b_2, b_3, b_4. With the switch in this position the circuit is completed from C_1 to *EFB* through the lamps and

thence to contacts b_2 and b_3, and so back to C_2, the lamps then being supplied directly from the mains. While in this position, if it is desired to charge the battery, switch *CMS* is closed and the circuit is now from C_1 to *B* and back through ammeter *A* to contact b_3, across to b_4 and through the variable resistance *VR* to switch *CMS* and so to C_2, the sum of the readings on meters M_1 and M_2 giving the correct consumption of energy. By regulating *VR*, the battery may be charged at different rates up to maximum, or may simply be kept floating across the mains. The number of cells required for the battery is taken as the voltage *V* between mains divided by 2; that is, on a 120-volt three-wire supply the battery would consist of 60 cells placed across the 240-volt outers and having the variable resistance in series with the battery.

Should the supply fail from any cause, the current in the solenoids *SS* on the board with the automatic switch, so as to indicate the state of charge of the battery. The voltmeter is provided with three marked points, one at 2.6 volts per cell to indicate maximum volts for normal charging; one at 2.08 volts per cell to indicate maximum normal discharge rate; and the third point at 1.9 volts per cell indicates the minimum voltage allowed on discharge. The ammeter is provided with a mark showing the normal charging current.

Everything has been designed so as to work in with the usual routine of theater work and to render unnecessary any operation requiring special skill or knowledge. The provision of the battery practically makes no additional call upon the theater electrician, and the fireman's duties are, if anything, lessened by this system.

Besides this, a most important point is that the cost of installing such an arrangement as here described is considerably less than providing an emergency installation of gas. Costs vary, of course, in every individual case, but from figures at hand the writer feels safe in asserting that the complete cost of a battery installation such as described will not exceed 60 per cent of the cost of a gas installation, and may be considerably less. This should be a strong argument for electrical engineers in pressing home the claims of such a solution of the emergency lighting problem.

Its appeal to the fire insurance companies and to the inspectors is no less weighty. Here is a system which comes quickly and automatically into operation on any failure of supply without any fuss or disturbance. If the main supply cannot be resumed within a reasonable time, or if for any other cause it is necessary or desirable to disperse the audience, there is no outward indication, as far as the lighting is concerned, that anything is amiss. This is such an important matter that it will at once rivet the attention of all those who have the control of, or the responsibility for, the safety of the public.

That the safety of the actors is as pressing as the saving of the public goes without saying and is emphasized by the tragic occurrences in many places due to stage fire risks. For the emergency lighting of the stage a modified arrangement on the same lines is adopted. Fig. 3 illustrates the connections for this scheme. C_1 and C_2 represent the supply mains, one of which passes through the meter; F_1 and F_2 are fuses, and *MS* is the main switch controlling a fuse board *FB*. On one of the circuits of this fuse board are grouped the dressing-room and corridor lamps used during the forenoons while cleaning operations are in progress. It will be noticed that the connection for this circuit is taken from terminal *a* of the fuse board to the double-pole two-way switch *TWS*, where it is connected to the terminals *b* and *C*. When this switch is in the upper position, as shown in Fig. 3, the connection is made through the upper contacts of the right-hand switch and so on to the lamps shown at L_1, L_2, etc. When, however, the switch is brought to the lower position, the current flows from contact *C* through the switch to the 10-volt portable battery *B*, and through it before passing to the lights L_1, L_2. This causes the battery to be charged from the mains in series with the lamps. The auto-switch *AS* has its solenoid connected across the mains permanently and its normal position is shown in the diagram.

The method of operation is as follows: At night, immediately after the performance and before the building is cleared, the electrician puts switch *TWS* into the lower position and thereafter shuts off the main switch *MS*. This breaks the current in the solenoid controlling the auto-switch, which immediately falls and makes contact across d_1, d_2, putting the emergency fuse board *EFB* into circuit with the battery *B*. From this fuse board the whole emergency lighting for stage,

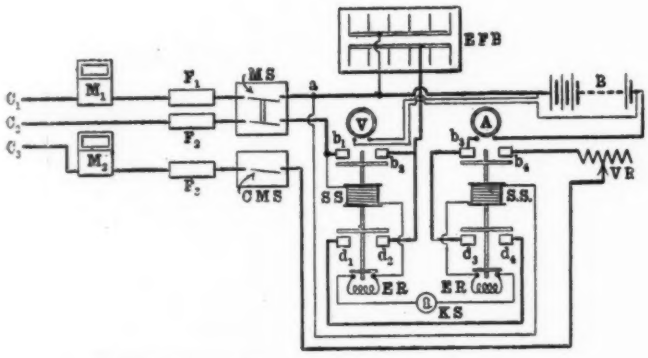


Fig. 2.—Auditorium Emergency Lighting.

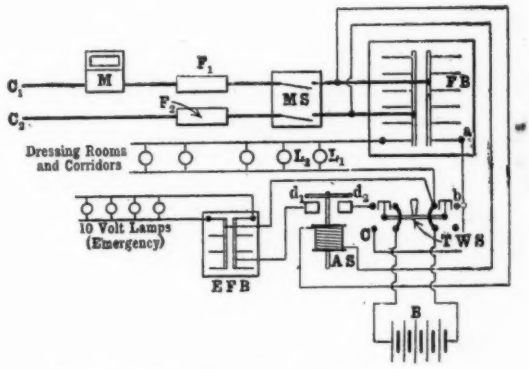


Fig. 3.—Stage Emergency Lighting.

ceases and the switch falls by gravity, making contact with the lower set of contacts d_1, d_2, d_3, d_4. The immediate result of this is to disconnect *EFB* from main C_2 and battery *B* from main C_2, while it puts *EFB* into circuit with the battery. The battery supply is from *B* to *EFB*, thence through the lamps and back to contact d_2, across switch blade to d_1, thence to d_4, and across switch blade to d_3 and so back through ammeter *A* to the battery. So instantaneous is the change, that only the slightest flicker can be detected on the lamps.

The fireman's key-switch is simply a tumbler switch operated by a special key which always remains in the possession of the fireman on duty at the time and which enables the solenoid circuit to be broken at will. This enables the fireman to test each evening before the performance begins if the emergency lighting is in working order; and it is part of the fireman's recognized duty to carry out this test every evening without fail. The ammeter and voltmeter are also provided

corridors, etc., consisting of from 20 to 30 lamps of 10 candlepower at 10 volts, is controlled. Consequently, on shutting off the main switch, these come into action; and besides forming a nightly test of the efficiency of the arrangement, it is also a plain hint that the theater is to be cleared. The building is then closed, leaving the switch *TWS* in the lower position. When the theater is opened the following morning and the main switch put on, the battery *B* is charged in series with the dressing-room lights, owing to the fact that the two-way switch *TWS* is in the lower position. When sufficiently charged, the electrician puts the switch into the upper position, thus cutting the battery off charge and placing it ready for use as an emergency circuit for the evening performance.

The cost of this stage emergency lighting is very small, and the simplicity of the arrangement and the fact of its absolutely automatic operation are points which cannot be too strongly emphasized.

The two arrangements taken together and applied to ordinary theater work would render the use of another illuminant quite unnecessary, and would tend to a much greater degree of safety than can at present be obtained in theater work. Of course, it is obvious that the application of this method is not limited to cases where a public supply can be obtained, but is quite as easily adapted to theaters or other public resorts having their own generating plants. It is thus of quite universal application, and its rapid adoption seems only a matter of having its simplicity of operation impressed upon those who may be responsible for the design of installations in such buildings.

This method has been applied also in an emergency lighting arrangement which has been installed in a large infirmary building to supply the lighting of the operating theaters. Curiously enough, within a fortnight of its installation the public supply failed on several occasions during critical operations and the emergency lighting came into operation so quickly that the change was scarcely noticed. The operating surgeons and staff have expressed their unbounded satisfaction with the new arrangement. This illustrates another and very important use for an emergency system like this.

It is said that the electrical contractors in one of the Southern cities have adopted the practice of imposing fines on employes of theirs when they leave joints unsoldered, or, by other carelessness, make it necessary to send a man back to a piece of wiring supposed to have been completed. The plan works well, it is stated.

Warren Orne.

The electrical contractor is not always a practical electrician. By close attention to business and through the exercise of tact and fine judgment in the selection and retention of experienced assistants, the contractor is sometimes able to succeed although his own personal knowledge of electrical construction is of a very general nature. The fact remains, however, that an extensive and intimate acquaintance with construction details, such as may be had, as a rule, through practical experience only, is an invaluable asset in the contracting business. The gentleman whose photograph appears in this column began life as a practical electrician and has been engaged in the electrical business in one way or another nearly ever since. Mr. Orne started in to learn the electrician's trade in 1881, working with his father for several years. They

Warren Orne,
President White City Electric Company.

maintained a shop on Randolph Street, in Chicago, their business being mainly that of bell wiring and small work, at first.

In 1891 Mr. Orne and his father organized The Orne Electric Construction Company, and a year later Warren Orne became the president of this concern. At this time the company mentioned was doing the largest strictly electrical contracting business of any company or individual in Chicago. Some time later Mr. Orne sold out his interest in the company, and was for a while engaged in other lines of work. About six years ago, however, he took over the management of the White City Electric Company, which had been organized a year or so before, and after two years with this organization he became its president, which position he still holds. Within the period of Mr. Orne's service, the White City Electric Company has grown from a business of only about $3,000 a year to something like $200,000 a year. The company has its headquarters at 227 West Van Buren Street, and most of its business is in Chicago. It has done work, however, through the central Western States.

The firm is a member of the National Electrical Contractors' Association and of the Association of Electrical Contractors of the State of Illinois. Mr. Orne, himself, attends the meetings of these two bodies frequently and is prominent for his part in the discussion of such matters relating to contracting and construction as come up for consideration there. His business philosophy might very well be put in the form of advice to younger and less experienced contractors, and be summed up as follows: Be certain that you are entirely familiar with any prospective contract before you submit your bid; when you have secured a job, follow the work up closely yourself, and be more concerned about giving your customer a "square deal" and making him your friend than in managing the contract so as to secure the largest possible amount of money therefrom; be always on the alert to promote higher standards of electrical construction.

Mr. Orne thinks that the contractor should not go to the trouble to make up an estimate on a job unless he is reasonably sure that he will be given the work if his bid should be the lowest one submitted. When he does undertake to make up his estimate with a view to submitting a bid he should insist upon being given an adequate set of plans and specifications, and upon being allowed to take these to his office and devote sufficient time to the study of them to make sure that he is entirely familiar with the work to be installed. He is then in a position to submit an intelligent bid, and under no other conditions should he ever venture a bid at all. Mr. Orne thinks a pleased customer is one of the best of assets of any contracting business. He is a strong believer, too, in the better methods of electrical construction and never misses an opportunity to discourage the extension of the less permanent and substantial types of wiring. At a recent convention of the Illinois Contractors' Association he made a motion to have the Association go on record as favoring the general adoption of conduit wiring for concealed work. Although the motion was not adopted, his arguments in favor of it were presented with force and clearness and did much to emphasize the need of improvement in electrical construction in some localities.

A man of thorough training as a mechanic and of ripe experience as an electrical contractor, Mr. Orne is well qualified to speak on matters pertaining to the profession.

Electrical Code of Des Moines.

The City Council of Des Moines, Ia., has recently approved a new set of rules governing the installation and operation of electrical wires and apparatus within the city which makes valuable reading for those interested in work of the kind. The book of rules, which was prepared by J. B. Dempster, the city electrical inspector, follows the National Electrical Code rather closely; but there are interesting changes in certain of the Code rules, and the grouping of rules is quite different from that found in the Code. Mr. Dempster's aim in the preparation of the book of rules was to group together all rules applying to any particular part of construction work. For example, all rules relating to service entrances into buildings are brought together in one group, and the same is true, as far as it was thought could be, of rules bearing on other subjects. A few of the more interesting of the requirements made to meet local conditions and some of the modifications and additions to Code rules are given below:

The Electrical Inspector shall be assigned to the Fire Department, and his term of employment shall be determined in the same manner as for other members of the Fire Department of the City of Des Moines. Such electrical inspector shall be a practical expert electrician and competent to pass a rigid and thorough examination. He shall pass an examination under the Civil Service Commission to be prescribed and conducted by three expert electricians, who shall be selected by the Civil Service Commission, one from a list recommended by the Electrical Workers' Union, one from a list recommended by the insurance companies, and one from a list recommended by the Commercial Exchange of the City of Des Moines.

When authorized by the City Council the Superintendent of he Department of Public Safety and the Electrical Inspector shall employ through the civil service such other assistants as may be necessary to carry on the work of inspection as provided for in this ordinance.

No building shall be wired for the placing of electric lights, motors, heating devices, signs or displays, or other electrical apparatus, nor shall any electrical apparatus be installed in or upon any building, without first securing from the said Electrical Inspector, or his assistant, a permit therefor; nor shall any alteration or change be made in the wiring of any building, or in any electrical installation therein or thereon, either before or after inspection, nor shall electric current be connected to any wires or apparatus, without notifying the said Electrical Inspector and securing a permit therefor; provided the said Electrical Inspector may at his discretion issue a general permit to theaters, telephone and telegraph companies, or to any person, firm or corporation owning or controlling any building, for a term not exceeding three months from the date thereof, authorizing minor alterations or changes in the open and exposed work of any electrical installation in such building, to be done by competent electricians, who shall be named in such permit, but such general permit shall be revocable at the pleasure of said inspector.

No person, firm or corporation shall engage in the business or represent himself to the public as engaged in the business of installing electrical wires or apparatus in or upon buildings, tents or other structures within the City of Des Moines without first appearing in person or by duly authorized representative before the said Electrical Inspector and registering the name and place of business of such person, firm or corporation, and securing a certificate of registration; provided, however, that no such certificate of registration shall be issued until such person, firm or corporation shall have filed with the City Treasurer a bond with good and sufficient sureties in the penal sum of $1,000, conditioned upon the faithful performance of all work entered upon or contracted for by him or them, and for the strict compliance by him or them with all of the provisions and requirements of the ordinances of the City of Des Moines relating to the installing, operating and maintaining of electric wires and apparatus within said City. All certificates of registration shall be made to expire on the first day of April next ensuing after the issuance of such certificate. No permit for the construction, alteration or repair of electrical apparatus shall be issued to any person not registered and bonded as required by this ordinance.

No person having charge of the construction, alteration or repair of any building, or no other person, shall cover or conceal or cause to be covered or concealed, and wiring or electrical apparatus for which permit has been issued or for which permit is required before the said wiring or apparatus has been inspected and approved as required.

The Electrical Inspector shall have authority to remove or cause the removal of lath, plaster, boarding or other obstruction which may prevent the proper inspection of wires or electrical apparatus.

It shall be unlawful for any person, firm or corporation generating current for electric light, heat or power in the City of Des Moines to connect its system or furnish current for electrical purposes to any building or premises, the wiring of which shall not have been inspected and approved by the Electrical Inspector. Any person, firm or corporation violating the provisions of this section shall upon written notice from the Elecrical Inspector to do so, immediately remove such connection and cut off such current.

Any person, firm or corporation who shall without permit therefor cause or allow electric current to be turned on in any building where the same has been cut off by direction of the Inspector, or shall otherwise violate any of the provisions of this ordinance, or shall fail, neglect or refuse to comply the rules and provisions of this ordinance, or shall fail, neglect or refuse to comply with any order or request of the said Electrical Inspector, or competent assistant designated by him or the City Council, in pursuance of and by the authority of any of the provisions of this ordinance or the rules therein contained, or shall in any way interfere with, hinder or obstruct the said Electrical Inspector or his assistants in the performance of his official duties, shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined not more than one hundred dollars or imprisoned not more than 30 days.

Any person dissatisfied with the action of the Electrical Inspector upon any matter covered by this ordinance may have such action reviewed by the Superintendent of the Department of Public Safety and the City Council; and such Superintendent of Public Safety and the City Council may on their own motion, review the action of said Electrical Inspector.

General Rules.

All wires must be so spliced or joined as to be both mechanically and electrically secure. The joints must then be soldered unless made with some form of approved splicing device, and covered with an insulation equal to that on the conductors.

Stranded wires (except in flexible cords) must be soldered before being fastened under clamps or binding screws, and whether stranded or solid, when they have a conductivity greater than that of No. 8 B. & S. gauge they must be soldered into lugs for all terminal connections, except where they approved solderless terminal connector is used.

Must be so installed that no strain is placed on joints or splices.

To be mechanically secure, in a straight-line splice of the "Western Union" type, each wire should have at least four complete turns around the other wire; in a tap splice of the same variety the tap wire should have four wraps around the line wire; in a splice of the dead-end type the wires should be given at least four turns.

No joint or splice will be approved that is less than three-fourths inch in length.

A perfectly soldered joint should have the following characteristics:

All parts of the wires from which insulation has been removed should be thoroughly tinned to insure preservation.

Solder should be flowed freely into all parts of the joint to insure electrical conductivity and mechanical strength.

The following formula for soldering fluid is suggested:

Saturated solution of zinc chloride .....5 parts
Alcohol .....4 parts
Glycerine .....1 part

To properly tape a joint in rubber-covered wire:

Braid should be removed and rubber beveled so that rubber tape can make good waterproof point with rubber cover of wire with no loose threads or parts of braid between rubber tape and rubber cover on wire.

Joint and beveled ends of rubber cover of wire should then be given a thin coat of pure rubber cement.

Rubber tape should be applied under tension, that is, stretched until its width is reduced about one-half, and built up in even layers until slightly thicker than the rubber on wire.

Gentle heat should be applied to slightly vulcanize joint.

Joint should finally be covered with two layers of friction tape, lapping well over on braid, and given a coat of insulating paint.

Entrance of Wires to Buildings.

Before any entrance is installed in any building, contractor or person doing wiring must obtain from lighting company or persons who are to supply current to the building a written statement in duplicate as to where entrance to building must be made to avoid bracketing around building, or in any manner running service wire across windows or along the surface of the building. One of these duplicate statements must be placed on file with the Electrical Inspection Department.

For overhead service all entrances must be made in approved conduit work—outer end of conduit must be provided with an approved fitting and innner end of conduit must be provided with an approved steel cabinet.

Entrance conduit must be grounded —ground connection must be made to water piping between meter and the street or to an approved ground plate in the absence of water piping—connections between conduit and ground connection not to be smaller than No. 6 B. & S. gauge copper wire.

Entrance connections from main cutout to the outside of building to be made with at least No. 10 B. & S., approved rubber-covered double-braid wire—such wire must extend at least four feet beyond outer entrance fitting.

Where underground service enters building through tubes, the tubes shall be tightly closed at outlets with asphaltum or other non-conductor, to prevent gases from entering the building through such channels.

No underground service from a subway to a building shall supply more than one building except by permission from the Inspection Department.

It is strongly recommended that entrance to residences be made in underground construction extending from basement to pole at curb line.

Entrance cutout and switch must be installed on all service wires at the point where the wires enter the building; must be arranged to cut off the entire current; and must be inclosed in an approved cabinet, in plain sight and readily accessible.

In case of heavy mains which may be of sufficient carrying capacity to cause a serious burnout if they should become grounded to the conduit the Inspection Department may require such mains to be installed where possible in underground work or in open work on knobs or cleats and protected with approved steel boxing. Wires of greater capacity than No. 0000 must not be placed in conduit.

The "drop" or loss of potential in mains must not exceed two per cent of total potential, with full load, between entrance cut-out and distributing point.

Fuses and cutouts must be inclosed in an approved dust-tight steel cabinet, in plain sight, and readily accessible. They must not be placed in the canopies or shells of fixtures. All openings into cabinets must be effectually closed. This necessitates the taping of tubing where it passes through the cabinet.

Switches that will be regularly used for the turning on and off of circuits should not be located in the same cabinet with fuses.

All switches and switching devices having bare live metal parts must be inclosed in an approved dust tight steel cabinet, except when located upon switchboards or installed with motor-starting device.

The drop or loss of potential in any branch circuit must not exceed two per cent with full connected load. To comply with this requirement No. 14 B. & S. gauge wire must not run a greater distance than 64 feet (double distance) for a circuit of 660 watts.

Wires in branch circuits must be installed so that no strain can come on joints or splices, and must never be run on knobs on upper edges of joists or on upper side of any surface unless incased in approved molding or armor.

When run in accessible attics without flooring, the inspection department may require wires to be protected by flooring laid for the purpose.

In knob-and-tube wiring tubes through joists must be slanted, staggered, or wedged in, or else some other effective means must be employed to prevent the tubes from slipping out of place.

Flexible tubing at outlets must be secured in place so as to prevent withdrawal of tubing or the slacking back of wire through it. Wires must extend six inches beyond tubing, for proper connection of fixtures and switches.

The so-called "roughing in" of concealed knob-and-tube wiring is understood to mean that: All wires to be concealed are properly installed, ready to be covered up; all outlets properly made and completed as required by these rules; all fuse cabinets and necessary cut-outs in place; entrance and meter loop and meter board properly installed; all circuits properly wired, connected and insulated. No job of "roughing in" concealed knob-and-tube work will be considered as completed until all plumbing, heating, gas and water piping and other metal work of the building which might possibly interfere with the electric installation is completed.

"Roughing in" of armored construction is understood to mean: All conduits, cable, or sheathing in place; all outlet boxes, plates, cutout cabinets and conduit for entrance installed; meter board in place and securely fastened; provision for all necessary circuits, and outlets properly made and secured in place.

Metal conduits, where they enter junction boxes, and also all other outlets, etc., must be provided with approved bushings or fastening plates fitted so as to protect wire from abrasion, except when such protection is obtained by the use of approved nipples, properly fitted in boxes or devices.

If bushings do not screw tightly on end of conduit, Inspection Department may require the use of a lock nut on the inside of box as well as a bushing.

So-called long thread or running thread couplings must have ends of pipe in contact within the coupling and must have locknut at each end of coupling to insure good mechanical and electrical joint. The use of long thread coupling must be avoided where possible.

Connections to grounded pipes and to conduit must be exposed to view or readily accessible, and must be made by means of approved ground clamps to which the ground wires must be soldered.

Among Contractors.

The firm of T. J. Burns, of Lynchburg, Va., is doing the electrical work in the buildings of the new Randolph-Macon Woman's College, at Lynchburg.

Childers and Waters, of Lousiville, Ky., will soon commence the electrical work upon the new building of the Young Men's Christian Association in that city, a structure which is costing upwards of $300,000. An elaborate system of electric ventilators and fans has been planned for it, with complete conduit wiring and handsome fixtures. The Childers and Waters contract involves $35,000.

An array of fine residence work has been lined up by Daubert and Schrecker, well known electrical contractors of Louisville, Ky., recently. The Gateway City firm is working upon a conduit wiring system and complete outside lighting equipment at the S. C. Henning residence in Cherokee Park, and is re-wiring the Schieman store and dwelling at First and Walnut Streets. The residence of Garland Mourning on Fourth Avenue is also being wired in conduit and this firm has the contract for the residence of Fred M. Sackett, with a garage.

James Gray, Normal, Ill., has received the contract for wiring the public school building at that place.

The Mueller Electric Company, Ottawa, Ill., has been awarded the contract for wiring the building at the La Salle County Asylum.

The Perkins-Milton Electric Company, contractors and dealers in electrical supplies, of Greensboro, N. C., will become the Perkins Electric Company, about October 1, when R. H. Milton, the present manager, will retire from the firm. The management will be taken over by H. C. Perkins, the president of the company.

Clifton W. Whitmore, electrical contractor, 521 Main Street, Lynchburg, Va., is wiring the new post-office building at Lexington, Va., and is also installing the electrical work in a large building for the Griggs Packing Company at Roanoke, Va. These are both conduit jobs.

The Hatfield Electric Company, of Indianapolis, Ind., has secured the contract for wiring the new Union Central Life Insurance Building, in Cincinnati, and has begun installing the conduit. This building will be one of the tallest, if not indeed the tallest, office buildings outside of New York City. It will stand 535 feet or 36 stories high.

National Association of Electrical Inspectors.

THOMAS HENRY DAY, president, 59 Deerfield Street, Hartford, Conn.
JAMES BENNETT, vice-president, 524 Coristine Building, Montreal, P. Q.
WILLIAM LINCOLN SMITH, secretary and treasurer, Concord, Mass.
JAMES E. COLE, National Conference Representative, 11 Wareham Street, Boston, Mass.

Executive Committee:

H. S. WYNKOOP, chairman, 13 Park Row, New York, N. Y.

Frank R. Daniel, R. P. Strong, Henry E. Knight, Washington Devereux, James B. McCarthy, W. Lincoln Smith, James Bennett, C. W. Mitchell, George L. Collison, T. H. Fritts, James S. Meade, T. Henry Day, James E. Cole, Thomas D. McColl

Secretary's Message.

The questions which appear in the current number are quite simple and the replies received would appear to need no amplification nor comment.

The Secretary regrets that the matter for this issue is so small in amount, but it is not his fault. Only five out of the fourteen members of the Executive Committee replied to his question circular of August 5. He is aware of the disturbance caused by summer vacations, etc., but wishes to suggest that it does not take very long to answer four questions and that the replies received came from some of the very busiest jurisdictions. It is not yet too late to make use of the replies to questions 199 and 200 and each member must have somewhere on his desk an envelope stamped and addressed ready for use.

The Secretary wishes further to state that the suggestion (approved by the Executive Committee) submitted to the members that the name of the Association be changed has been adopted by a large vote, so that henceforth the name of the Association will read, NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association: it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Location of Cutout and Switch for Electric Signs.

Question 196. Would a standard metal sign, supported on the face of a brick or stone building, require a main switch and cutout if the service wires did not enter the building but came direct to the sign from a circuit used exclusively for flat-rate signs and windows and controlled by an oil switch on a pole in front of the service company's office?

Answer 1. Rule 83*g* would require that the sign be fused.

Answer 2. There could be no objection to this method of installation so long as the master cutout and switch were provided for each sign, and same made readily accessible in the event of any trouble on sign.

Answer 3. Yes; I would require main switch and cutout even if the service wires do not enter the building; otherwise if it were necessary to repair or alter one sign, all the signs on the circuit would be cut off during such alteration or repair.

Answer 4. This question would seem to be incomplete, for the "oil switch on a pole in front of the service company's office" might be miles away from the sign referred to in the question. This, of course, would not be permissible, and we think the better plan is to have a suitable switch and cutout for the sign in question located in the immediate vicinity of the same; switch and cutout to be properly installed and protected, of course.

Answer 5. Under a strict wording, or interpretation, of the rule no switch would be required within the building, the conditions being as cited in the question. But, for the protection of the service company, would it not be more in keeping with good engineering practice to have the switch nearer the load? This would seem to be especially advisable since, as the question indicates, it is the purpose to have a number of flat-rate installations, both inside and outside of buildings, on the same circuit.

Answer 6. I should judge that if any wiring is attached to the building, Rules 23*a* and 24*a* apply, and the wiring should be under the protection of a service switch and cutout. The switch and cutout would also be required under Rule 39, which, according to its title, would cover any wiring on the exterior of the building, with the exception of that portion in or on the sign itself, which portion is covered by Rule 83.

Answer 7. No; provided that the service wires did not enter the building and the circuits in sign were protected in accordance with Rule 83*g*. Also, in reading this question, we notice the wording "exclusively for flat-rate signs and windows controlled by an oil switch on a pole in front of the service company's office." To control the window lighting would be a violation of rules 23*a* and 24*a* because the wires would be introduced inside the building and would be the equivalent of a service.

Answer 8. This would depend entirely upon the load on the wires feeding the sign, the size of the wires, and the amount of apparatus between the switch and the sign. I should not pass the sign, as indicated in this question, in this territory, as I believe the spirit of the Code and interest of the owner demand the equivalent of a service switch and cutout upon an illuminated sign of any size.

Answer 9. No.

Answer 10. I think it should have at least an individual cutout, but doubt

if a switch could be required. I take it that other signs are on the same circuit.

Answer 10. The Code does not require a service switch and cutout under the conditions cited. Probably, however, a pole cutout could be demanded under the general rule requiring a fuse wherever the size of wire changes, and the argument that even a cutout installed at the oil switch in front of the company's office would afford no protection to the sign holds if more than one sign be installed on the circuit. Incidentally, does not this question suggest a reason for permitting knobs on sign and outline wiring while prohibiting them for the support of other wires exposed to the weather? (See question 194.)

Answer 12. Most assuredly; the fact that the service wires do not enter the building, does not alter the conditions covered by Code rules. The sign being on or in front of the building constitutes a fire hazard.

Distance Between Wires for Three-Wire and Five-Wire Services.

Question 197. Is it permissible to place any of the wires of a three or a five-wire service less than one foot apart on the outside of a building?

Answer 1. Rule 12*b* requires wires on "outside work" to be not less than a foot apart.

Answer 2. Rule 12, section *b*, reads, "Must be so placed that moisture cannot form a cross connection between them, and, except when run in conduit, not less than a foot apart." The language of the rule would appear to answer the question in a definite manner, although practice, from point of appearance to the building, has suggested, and permitted, a separation of eight inches between two of the service wires, where there are three or more wires. The practice, however, is not in keeping with the rule.

Answer 3. Rule 12*b*, answers this question; the wires should be placed not less than one foot apart.

Answer 4. No; not unless run in conduit. See Rule 12*b*.

Answer 5. No. Rule 12*b* requires that wires exposed to moisture, except when run in conduit, be kept not less than one foot apart, and there seems to be no reason for departing from this requirement. With the smaller wires, the wires can readily be cabled to the first point of support and then run in conduit, and in the case of large wires, when larger than No. 6 B. & S., the conditions are such generally that the mechanical details demand the one-foot separation.

Answer 6. No. No provision is made for placing a neutral between two wires with standard separation as in inside work.

Concerning Protection of Switches and Cutouts in Moving-Picture Booths.

Question 198. Is it necessary, under the Code, to install live current-carrying parts, i. e. cutouts and knife switches, in an approved cabinet in a motion-picture booth?

Answer 1. Under Sections *c* and *t*, of Rule 38, we are inclined to the opinion, and have insisted upon it, that all cutouts and switches, or other exposed live current-carrying parts, in the booth of a moving picture establishment, should be safeguarded in some manner against accidental contact; and we know of no better manner than to install them in a properly constructed cabinet.

Answer 2. Yes; by all means. Throughout the theatre, wherever knife switches or cutouts are mentioned in the Code, cabinet inclosure is required, with the single exception of the stage switchboard, where a guard rail is specified as a substitute safeguard. While the inclosure is not again called for under Rule 38*u*, I should consider the matter fully covered by Rule 38*t*, as in a great majority of cases the booth is built within the auditorium.

Answer 3. Yes; Rule 19*b;* owing to the limited space in the booth and the liability of live metal parts being exposed to accidental contact.

Answer 4. The presence of any exposed current carrying parts in the vicinity of a moving-picture machine is distinctly hazardous. This department has records of a number of film fires caused by accidental contact with "live" metal parts, and in one instance contact with the supposedly insulated outer shell of a brass socket ignited a film.

Rule 38, sectons *b* and *t*, requiring a complete steel-clad system for theatres and moving-picture establishments, gives ample authority to require cabinets, which would also be specifically required under Rule 19*b*, owing to the undoubted presence of easily ignitable material.

Answer 5. Yes. I think ample authority can be found, especially by the whole purpose of Rule 38, to require inclosing all live parts.

Answer 6. The Code contains no positive requirement that cutouts and knife switches shall be inclosed in an approved cabinet in a moving-picture booth. It is the practice in this territory to judge this point under our general requirements, taking into consideration the safe location of the cutout or switch, the free space in front of it and the probability of other objects coming in contact with the live parts. The average booth, however, is so cramped as to space that generally we are obliged to call for a cabinet.

California Association of Electrical Inspectors.

At a meeting of municipal and underwriters' inspectors from various parts of the state held recently in San Jose, Cal., steps were taken toward the formation of an organization to be known as the California Association of Electrical Inspectors.

W. O. Spencer, City Electrician of San Jose, was chosen chairman; Ed. W. Jewel, City Electrician of San Diego, secretary; and P. A. Anderson, Chief Inspector of Oakland, treasurer.

It was thought advisable to solicit the membership of all electrical inspectors, including those representing municipalities, boards of underwriters and public utility corporations, for the uniform enforcement and interpretation of National Electrical Code. C. W. Mitchell, of San Francisco, and H. N. Beecher, of Los Angeles, were chosen to represent the Association in soliciting membership of all inspectors in their respective territories.

A committee was chosen to formulate rules and by-laws to govern the Association, the members having under consideration the adoption of the rules and by-laws of the National Association of Electrical Inspectors. A committee is also to be established to act as arbitrators between contractors and inspectors whenever discussions arise as to the interpretation of the Code. The California State Association of Electrical Contractors, then in session, appointed three members to work in conjunction with the members of this committee.

All the members of the Association felt that much good would come to all concerned from this organization, and each member pledged himself to do everything in his power to promote the interests of the body.

In Greensboro, N. C., the municipal electrical inspector does not receive a regular salary. He receives, instead, a percentage of all the fees collected for inspections, which in this town of 20,000 people is found to be enough to justify a man in keeping the position.

Among the Supply Men

Co-operation Among the Electrical Trades.

One of the most interesting papers at the excellent convention of the California State Electrical Contractors' Association, held at San Jose, July 24-27, was that of Albert H. Elliott, entitled "Co-operation Among the Electrical Trades." So much of what Mr. Elliott has to say is of pertinent interest to the jobber as well as the contractor that it is published here in the hope that it may have a wide reading. Mr. Elliott says the subject is as old as time, and the idea is as fundamental as the Ten Commandments. It is necessary, however, to keep on preaching and teaching, to keep on educating until at least a majority of those engaged in the same line of business shall come to see the light. He goes on to say:

We have no schools and colleges in which those engaged in the electrical business can be educated in the simple great economic truths underlying their business. For the present, associations and their conventions and meetings must do the work. You are to listen, then, for a few minutes to a lecture which has for its subject a very simple theme, and I shall try to present it in a simple manner.

The process by which raw material is taken from the ground, wrought into electrical goods by the skillful fingers of the manufacturer, transported in bulk quantities to the jobber, spread on the jobber's shelves where the contractor may pick and choose, placed by the contractor in the home or business building of the ultimate consumer—this process is a great fact, as old as the laws of business itself. We did not make this process and we can change it but slightly as the years roll around. So long as we are a legitimate part of the process, we should be satisfied to render our portion of the service by which goods are manufactured and sold.

The channels of trade have been cut in the geological strata of the business world for ages and ages. I think it is fair to assume that the process will go on in the same way for a long time to come—such a long time that there is no use asking the question as to whether this or that branch of the industry shall be done away with. If we are satisfied that the electrical contractor—the man who takes the goods from the shelves of the jobber and installs them—is a part of the channel, so to speak, then we can begin to investigate our subject without fear that we shall be charged with making an aeroplane journey into the light upper air of pure theory.

At the very start I oppose competition—that is, the kind of competition which the word usually connotes—to co-operation. There is competition of service and quality which is not opposed to the idea of co-operation, but is a necessary incident of it. Competition in mere price, however, with its expensive armaments and standing armies, is opposed in idea to co-operation, for a very obvious reason.

In no part of the process of the creation and distribution of electrical goods does there seem to be room for the suggestion that the goods can be sold for less than the cost of production for any length of time without wrecking the entire process. This is one of those simple truths which we must get into our system by a process of repetition. We want every man engaged in the electrical business to be inoculated with it. We want the germ to get into his system, until he breaks out with a rash and spreads the virus to all with whom he comes into contact in his business world.

We want it to work both ways, so that neither will you try to sell goods or do work yourself for less than cost, nor will you ask the other fellow to do it. We want your business itch to be so strong that an uncomfortable irritation will be immediately set up when the idea gets into your heads that you are smarter than the others and can sell goods or do work for less than cost and succeed, where others have failed.

The consumer should not be forgotten, and I want to speak a word for him today. Too often is he forgotten at these business conventions where we are all busy finding out how we can shove more goods at him, at a higher profit.

There can be no true co-operation which ignores the consumer. Here is another of the simple ideas which will bear repetition. When you find a group of business men putting up a job on the consumer, you can look for as much co-operation as you would find between the Barbary pirates and the crew of a Spanish galleon.

The consumer wants two things above all else—good service and good quality. Of course, the price should be reasonable—that is, a reasonable advance on the actual cost of production. But the consumer demands that his house shall not be burned by your poor goods and your bad installation. He knows that good goods and first-class installation cannot be procured at less than cost. You co-operate with the consumer when you give him "good goods," installed in a first-class condition. You hurt the consumer when you give him bad goods, poorly installed.

If because of a freebooter struggle with your neighbor in business you make up your inevitable losses by cheating the consumer through the simple process of bad material and worse installation, the system of co-operation breaks vitally at its ultimate point. And notice how the break shatters the entire structure.

Where do you get your bad material? You cannot keep up the foolish fight with standard goods, and you begin to hunt around for material that looks enough like standard to fool the unwary eye of the consumer. Here is the second break in the chain of co-operation. Possibly you can find a jobber who will in turn find a manufacturer who will produce the article you are looking for. What a splendid plan it is! So long as standard goods are maintained all the general co-operative structure stands. What a nice little time you are having, even if you do bring in an earthquake now and then. You are content for others to hold up the structure even if you do crack it some.

But when it falls where are you with your pretty plan of chicanery? You are the first to go under, because in a business storm the houses not built upon the solid rock of business probity are swept away.

We must see, then, that real, true co-operation is not a theory, or a mere ethical maxim. I am not preaching a sermon to you, good in convention days, but not to be practiced during the working week. It is the distinction between selfishness and self-interest which should be borne in mind.

Very often a wise man is born into the electrical business. He knows so much better than those who have

breathed electric currents all their lives that he wants to show them a thing or two. Like the crank who fiddles with perpetual motion, he must have a demonstration. If any of you think that you are such a wise man—a meteor shot athwart the black sky of the electrical business—get your demonstration before you enter the business. Study the methods of the wisest heads in the American business world today. You may pull a few others down with yourself in your reckless experiment, but we can guarantee that you go down yourself, because the laws of business are as inevitable as the laws of gravity, and if you can prove that goods can be sold at less than cost at a profit, you should be addressing this convention on the subject, "How to 'blow in' profits and not 'blow out' your business."

Co-operation, then, has taken the place of bare-clawed competition. We have progressed far from the jungle days of business. We want to live and let live. Our competitor is not our natural enemy. Business is not made from the backs of others. A rational harmony indicates healthful business conditions.

The Columbian Electrical Company, St. Joseph, Missouri, does a retail business of about $35,000 per year. This company covers Missouri, Kansas, Nebraska, Iowa, South Dakota, Eastern Colorado, Southern Wyoming and Oklahoma. The business was established in 1893 as a corporation. The officers are as follows: President, W. R. Thomas; treasurer, Dr. Jacob Geiger; secretary, T. O. Strong. The company reports business active in independent telephone equipment, and extensive high-voltage transmission equipment for lighting and power.

The Harry I. Wood Company, of Louisville, Ky., has sold six Allis-Chalmers motors, 15 to 40 horse-power capacity, to the Louisville & Nashville Railroad Company. The motors are complementary to an outfit furnished the Louisville & Nashville shops in Louisville some time ago by the Wood company, consisting of three 350-kilowatt generators and 40 motors.

Public Service Commissions

NEW YORK.

The Public Service Commission for the First District last week opened bids for the construction of five sections of the new subways proposed for the dual system of rapid transit. According to the lowest bids received, the cost of building these five sections will be more than $8,000,000. They include two sections in Brooklyn on the Fourth Avenue subway, one section in The Bronx on the Southern Boulevard subway, and two sections in Manhattan on the southern part of the Broadway-Lexington Avenue subway.

Nine bids were received for the construction of Section No. 1 of the Broadway-Lexington Avenue line. This runs from Trinity Place, near Morris Street, Manhattan, under Trinity Place and Church Street to a point north of Dey Street, and will have a station in Trinity Place and another in Church Street. The lowest bidder for this section was F. L. Cranford, Brooklyn, with a bid of a little more than $1,200,000.

There were also nine bidders for Section No. 1-A of the Broadway-Lexington Avenue line, which runs from the northern end of Section No. 1 under Church Street, private property, Vessey Street and Broadway nearly to Park Place. F. L. Cranford, of Brooklyn, was also the lowest bidder for this section, his bid being about $982,000 on this work.

There were more bids for the two sections in Brooklyn than for any others. Fourteen bidders submitted proposals for the construction of Section No. 1, which begins at the present terminus of the Fourth Avenue subway at about Forty-third Street, Brooklyn, and runs south under Fourth Avenue nearly to Sixty-first Street, with stations at Forty-fifth Street, Fifty-third Street and Fifty-ninth Street. The lowest bidder for this section was the Degnon Contracting Company, New York city, with a bid of $1,930,000.

For Section No. 2, which begins at the southern end of Section No. 1, and runs down Fourth Avenue to Eighty-ninth Street, with stations at Bay Ridge Avenue, Seventy-sixth Street and Eighty-sixth Street, there were sixteen bidders.

The Degnon Contracting Company was also the lowest bidder for this section, with a bid of about $1,904,000.

Twelve bidders submitted proposals for the construction of Section No. 1 of the Southern Boulevard and Westchester Avenue subway. This is a branch of the Lexington Avenue line, and runs from One hundred and Thirty-eighth Street near Alexander Avenue, under East One Hundred and Thirty-eighth Street and Southern Boulevard, to a point near East One Hundred and Forty-seventh Street, with stations at Brook Avenue, Cypress Avenue and St. Mary's Street. The lowest bidder for this section was the John F. Stevens Construction Company, New York city, with a bid of about $2,253,000.

In a special pamphlet just issued, entitled "Dual System of Rapid Transit for New York City," the Commission gives many details regarding the new work. The total cost of the new system, it is stated, will be about $347,000,000, and its total length will be 629.7 miles of single track. This will include 296 miles of single track of existing rapid transit lines. While the existing rapid transit lines are carrying about 800,000,000 passengers a year, the new system will have a capacity of 3,000,000,000 a year, although it is not expected that such capacity will be demanded for some years after the opening of the new lines mentioned in the foregoing.

The Public Service Commission, Second Ditstrict, has authorized the Rochester Railway & Light Company to exercise franchises for the furnishing of electricity in the town of Chili, Monroe County.

The Commission has authorized the Rensselaer Falls Electric Light & Power Company to increase its capital stock from $8,000 to $12,000 and to issue $4,000 in capital stock. The proceeds are to be used in the discharge of obligations chargeable to capital account.

OHIO.

The Richwood Light, Heat & Power Company has received permission from the Public Service Commission to issue ten-year first-mortgage bonds of the par value of $10,000.

The Mt. Gilead Water, Light, Heat & Power Company has been granted permission by the Commission to issue five-per-cent preferred stock to the par value of $40,000.

A MOTOR-DRIVEN BLOWER UNIT FOR SHIPBOARD USE.

By Frank E. Fisher.

It is obvious that any apparatus for use on board ship should be built as compactly as possible and that it should be as efficient as is consistent with mechanical strength, reliability of operation, simplicity and long life.

The ventilation of a ship of any size requires a large number of units of various ratings. The general design, characteristics and methods of test are quite similar and a characteristic unit has been chosen for this discussion.

The requirements for this particular unit are as follows:

Blower.—The blower shall have a capacity of 6,000 cubic feet per minute delivered at a mean velocity of 2,000 feet per minute, measured in a pipe whose length is 20 times as long as the mean width and breadth of the fan outlet. A double Pitot tube (Fig. 3) shall be used to measure the impact and static pressures. An adjustable door in the end of the wooden test pipe shall be adjusted until the impact pressure in inches of water is not less than 28.5 times the weight per cubic foot of air in pounds.

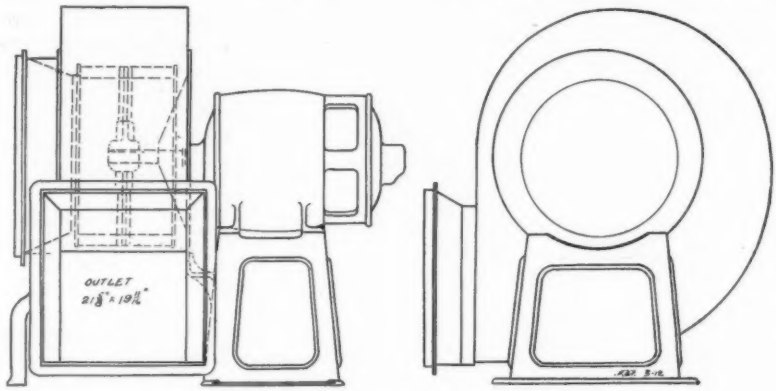


Fig. 1.—Motor-Driven Blower for Shipboard Use.

The static pressure must not differ from the impact pressure by an amount greater than 4.5 times the weight of air per cubic foot in pounds nor less than 4.0 times the weight of air per cubic foot in pounds.

The weight of air shall be corrected for barometric pressure and for moisture in the air in accordance with Table I.

The mechanical efficiency of the fan must not be less than 50 per cent when tested as above. In computing fan efficiency correction may be made for frictional loss in the pipe.

The combined-set efficiency, fan output divided by motor output, must be at least 39 per cent.

Motor.—The motor tests shall be as follows: Two heat runs shall be made upon the unit, the first running with fan inlet and outlet wide open for eight hours; the second running at full speed as determined by the efficiency test, and with the fan intake so restricted as to load the motor so that armature current is not less than 25 per cent in excess of that obtained on efficiency test. Each of the above runs shall be continued for eight hours and at the end of the run the temperature rises shall not exceed the following: Interpole winding, armature coils, armature core, pole tips and yoke, by thermometer, 40 degrees commutator, 45 degrees by thermometer and shunt field 40 degrees by resistance.

The mechanical test for banding and resistance against centrifugal strains shall be made by running the motor at double no-load speed for a period of 30 minutes, provided such speed does not exceed a peripheral velocity of 6,000 feet per minute.

The motor must commutate perfectly from no load to 25-per-cent overload, and without shifting the brushes.

The variation in speed from full load to no load will not be more than 15 per cent. The speed variation due to heating must not exceed 10 per cent.

TABLE I.—WEIGHT OF AIR IN POUNDS PER CUBIC FOOT.

Dry-Bulb Temperature. Addition for Each 0.01 of Barometer.	67		68		69		70	
Barometer.	Weight of Saturated Air.	2.6 Addition for Wet-Bulb Depression.	Weight of Saturated Air.	2.6 Addition for Wet-Bulb Depression.	Weight of Saturated Air.	2.6 Addition for Wet-Bulb Depression.	Weight of Saturated Air.	2.6 Addition for Wet-Bulb Depression.
29.4	07431	1 3	07325	1 3	07308	1 3	07292	1 3
29.5	07366	2 6	07350	2 6	07333	2 6	07317	2 6
29.6	07391	3 9	07375	3 9	07358	3 9	07342	3 9
29.7	07416	4 12	07400	4 12	07384	4 12	07367	4 12
29.8	07441	5 15	07425	5 15	07409	5 15	07392	5 15
29.9	07467	6 17	07450	6 18	07434	6 18	07417	6 18
30.0	07492	7 20	07475	7 21	07459	7 21	07442	7 21
30.1	07517	8 23	07500	8 24	07484	8 24	07467	8 25
30.2	07542	9 26	07526	9 27	07509	9 27	07493	9 28
30.3	07567	10 29	07551	10 30	07534	10 30	07518	10 31
30.4	07592	11 32	07576	11 33	07559	11 33	07543	11 34
30.5	07618	12 35	07601	12 36	07584	12 36	07568	12 37

TABLE II.—TEST OF MOTOR.

Time.	Line Volts.	Line Amperes.	Field Volts.	Field Amperes.	Speed R.P.M.	Room Temp.	Remarks.
8:00	120	32	98	.75	670	17	Weak-field run. Blower inlet restricted.
9:00	120	32	100	.73	676	18	
10:00	120	32	103	.72	681	19	
11:00	120	32	104	.71	685	20	
12:00	120	32	105	.71	685	22	
1:00	120	32	105	.71	685	24	
2:00	120	32	105	.71	685	27	
3:00	120	32	105	.71	685	27	
4:00	120	32	105	.71	685	27	
7:00	120	23	120	.90	540	20	Full-field run. Blower inlet and outlet unrestricted.
8:00	120	23.5	120	.87	550	20	
9:00	120	23.5	120	.83	552	21	
10:00	120	24	120	.82	560	21	
11:00	120	24	120	.82	563	21	
12:00	120	24	120	.82	566	21	
1:00	120	24	120	.82	570	21	
2:00	120	24	120	.82	570	21	
3:00	120	24	120	.82	570	21	
....	120	2.4	105	.71	685	..	No load, weak field.
....	120	2.3	120	.82	600	..	No load, full field.
....	120	..	...	...	1400	..	High speed for one-half hour air reading.
....	120	26	105	.71	685	..	

Cold shunt resistance, 129.4 ohms. Cold coil temperature, 18 degrees.
Hot shunt resistance, 148.8 ohms. Rise by resistance, 36.1 degrees.

RISES BY THERMOMETER.

	Weak Field.	Full Field.
Commutator	20.3	28.5
Core	20.3	28.5
Coils	22.2	30.5
Interpole	23.3	29.5
Frame	17.1	17.3
Fan bearing	18.2	18.1

The Unit for Test.

The blower is of the multivane type, single width, single inlet and is especially designed to meet the above requirements.

The casing is of spiral form, constructed of steel plate and angle iron; riveted together. The outlet is of rectangular form, 21.625 by 19.6875 inches. The casing is of the single-inlet type. The inlet is bolted to the casing in such a manner that by removing same, the runner can be taken out through

the opening thus produced. The inlet cones are so built that the outside surface is cylindrical while the inside surface is conical. The interior of the fan casing is galvanized for the purpose of preventing corrosion.

The casing is fitted with an inlet truss, which supports the casing on that side, while the other side is supported by means of a bracket extending from motor base.

The blades of the blower are made of refined steel plate, each blade being spooned with spherical depressions to more effectually and efficiently handle the air, by preventing too great a proportion slipping along the blade to that part farthest from the inlet, thus forcing the part of the blade nearest the inlet to do its share of the work.

The blades are riveted to annular steel side plates which hold them in place and make the runner strong and rigid for the service.

The runner has steel arms of T section, one end of which is cast integral with a cast-iron hub and the other end of which is riveted to the driving blades of the runner. The cast-iron hubs are accurately bored and splined and provided with a set screw over the key. The runners are accurately finished and carefully balanced for high speed. They are galvanized, and are overhung on the extended motor shaft.

Each fan is supported with a cast-iron motor base, so built that the motor, the runner, or both, can be removed without disturbing the foundation. The motor is open-type, shunt-wound, adjustable-speed and is equipped with four main poles and pour interpoles.

The frame is of cast steel and is bored to seat the pole pieces. The main poles are of laminated sheet steel assembled on rivets without intervening insulation. The pole tips are beveled and every lamination is cut off flush with the body giving a toothed effect which aids in securing first-class commutation. The laminated poles miminize eddy currents and insure homogeneous pole pieces.

The interpoles are of wrought iron and are approximately 80 per cent as long as the main poles.

The armature is built up of thin laminated sheet steel assembled directly on shaft. The coils are form-wound and are held securely in the slots by phosphor-bronze band wires.

The bearings are of bronze and are lubricated by ring oilers made of brass.

The field coils are form-wound and are subjected to the vacuum impregnating process.

The commutator is built of hard-drawn copper bars securely held in place by V-shaped clamp rings and is thoroughly insulated with mica. The brushes are of carbon and are equipped with liberal copper shunts. The entire motor is built with a view to producing a compact machine, light in weight, efficient and rugged.

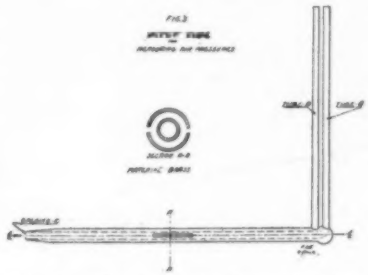


Fig. 3.—Pitot Tube for Measuring Air Pressures.

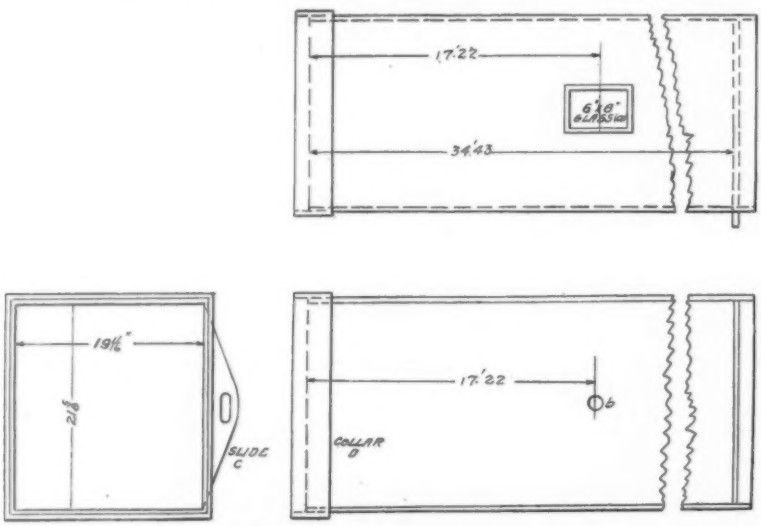


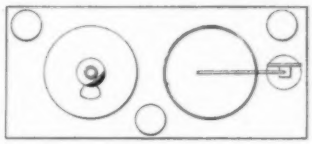
Fig. 2.—Wooden Test Pipe for Blower Testing.

Testing Apparatus.

Fig. 1, shows a general assembly view of the unit. The length of the testing pipe (Fig. 2); then is equal to 20 (21.62+19.69)/24 = 34.43 feet. The inside dimensions of the pipe correspond to those of the blower outlet. A glass plate 6 by 8 inches (Fig. 2, *a*) is placed in the center of the top of the pipe and a small hole (*b*) is bored at the center of the side of the pipe for inserting the Pitot tube. Correct alinement of the Pitot tube can be noted through the glass (*a*). A slide is placed in the outer end of the pipe and a wooden collar (*d*) is provided on the inner end. This collar fits around the blower outlet. The pipe is built of dressed and matched lumber, and is made as airtight as is possible. Care is used to keep the inside surface straight, smooth and of uniform cross-section.

The joint where the pipe collar meets the blower outlet is made tight by means of clay or other suitable material.

The Pitot tube is constructed as shown in Fig. 3. It consists of a brass tube through which air enters at *c* and passes out through tube *A*. This is surrounded by another brass tube of about twice the diameter which has two slots on the sides. The air passes through these slots and thence to tube *B*. The tubes are airtight with respect to one another. The pressure produced by the impact of the moving air is recorded through tube *A*, while the actual pressure in the moving air is recorded through tube *B*. The former is called impact pressure while the latter is called static pressure. The Pitot tube is inserted in the center of the test pipe, with opening *c* pointing toward the blower outlet. It should be tied in such a position that its center line will coincide with the center line of the pipe. A small deflection in any direction will alter the readings materially.



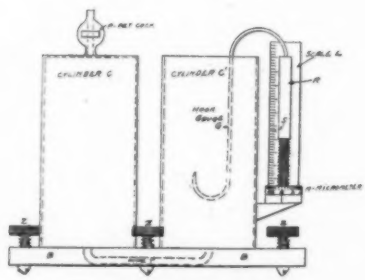


Fig. 4.—Manometer Gauge.

A manometer gauge is used for recording pressures. Fig. 4 shows the construction of a very satisfactory one. Two cylinders *C* and *C'* are mounted on a base *B* which can be levelled by means

of three screws *Z*. The cylinder *C* is sealed at the top but is accessible by means of a pet-cock *P* to which tube *A* or tube *B*, Fig. 3, are connected by means of rubber tubing.

Fig. 5.—Motor-Driven Blower.

The two cylinders are connected by a pipe *T* below the base *B*. Cylinder *C'* is open at the top. A hook gauge *G* is mounted on a threaded rod *R*. This rod is fitted with a pointer *S*, which travels by a scale *L*, and a screw micrometer *M*. The micrometer disk is divided into 50 parts and two complete turns of the disk are equivalent to 0.1 inch. Each division on the disk therefore is equivalent to 0.001 inch. The disk divisions are sufficiently large to enable accurate estimates to 0.0001 inch. The hook-gauge point can readily be seen just as it pierces the surface of the water and readings can be checked to 0.0005 inch when one is familiar with the apparatus.

A barometer, a wet-and-dry-bulb thermometer and a table showing corrections for atmospheric conditions, (Table I) are necessary for calculating the weight of air.

Line and field ammeters, a voltmeter and tachometer are necessary for taking readings on the motor.

The test for fan efficiency was made first. The runner was set out on the motor shaft so that it just cleared the intake cone.

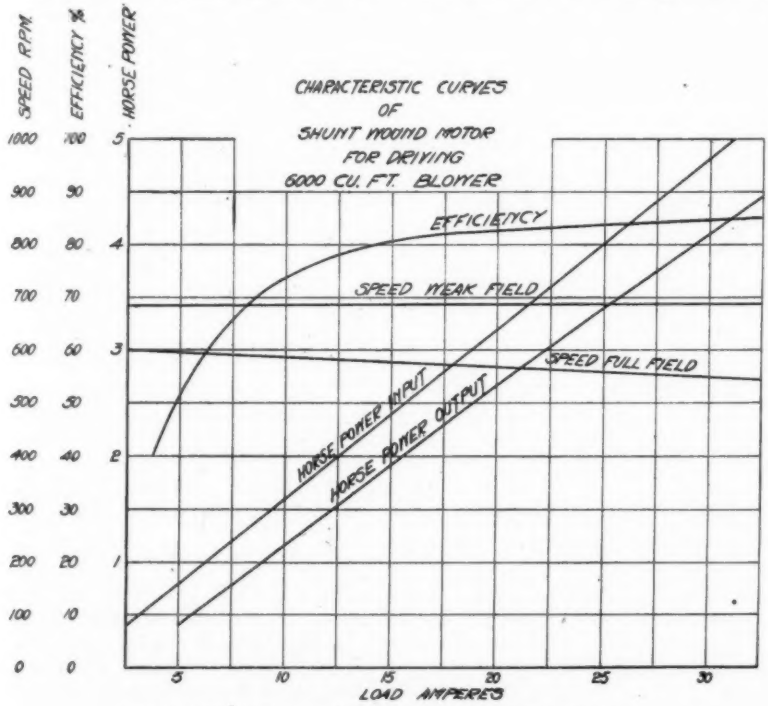


Fig. 6.—Characteristic Curves of Motor Driving Blower.

A wet-and-dry-bulb thermometer was placed near the blower intake, not directly in the draft of air. A wet bulb can conveniently be made by using a wick of waste saturated with water that has stood in the room for some time.

Readings of temperature showed a wet-bulb temperature of 64.4 degrees Fahrenheit and a dry-bulb temperature of 68.2 degrees or a difference of 3.8 degrees. The barometer registered 29.98 inches.

From Table I the weight per cubic foot of air at 68 degrees dry-bulb temperature and 29.9 barometer is 0.07450 pounds. The addition for 3.8 degrees wet-bulb depression is 0.000114 and for 0.08 inch on the barometer is 0.000208. The subtraction for 0.2 degree dry-bulb temperature is 0.000028. The correct weight of air to be used, then, is 0.07450 +0.000114+0.000208—0.000028 = 0.07479 pounds per cubic foot. The value of impact pressure must be at least 28.5 times this value or 2.136 inches of water. The difference between static and impact pressures must be within the limits of 4 and 4.5 times the weight of air, or the static pressure must not be greater than 1.8365 nor less than 1.799. Having our pressure values fixed, the next step is to fill the manometer with sufficient water to cover the hook-gauge point when just above its lowest point of travel.

The motor was started up at a line voltage of 120 volts and brought to the rated speed of 685 revolutions per minute by inserting resistance in the shunt field.

The pet cock *P* of the manometer was opened and the instrument leveled up by means of screws *Z*. The hook was then lowered and adjusted for a zero reading, the position of the pointer *S* being noted just as the hook-gauge pointer touched the surface of the water from below. An average of three readings showed the zero to be at 1.0 inch on scale *L*. The hook-gauge pointer was then raised 1.068 inches, or one-half the value specified for impact pressure. This is the setting for an impact reading of 2.136, since the hook gauge travels only half of the difference in water level in the two cylinders.

The pointer read 2.068 on the scale *L*. Tube *A*, Fig. 3, was attached to the pet cock *P*, and the slide *c*, Fig. 2, was moved until the water level just covered the point of the hook gauge. The hose leading to the Pitot tubes was changed to tube, *B* and a reading of static pressure was noted. The water level fell and when a correct adjustment of the slide *c* was obtained, the scale reading was between 1.918 and 1.899. An average of three sets of readings gave a value of static on the scale of 1.907, or a difference of scale reading of 2.068—1.907 = 0.161. The difference in water level then is 0.322 inch and the values of impact and static pressure are respectively 2.136 and 1.814 inches of water.

According to Taylor an approximate formula for velocity, when a single reading of air is taken at the center of the pipe, is $V = 997\sqrt{h/W}$

where V = velocity of air in feet per minute, h = difference between static and

impact pressures in inches of water and W = the weight of air in pounds per cubic foot.

V then equals 977 $\sqrt{.322/.074794}$ = 2070 feet per minute.

The area of the fan outlet and the interior of the test pipe is (21.625 x 19.6875) /144 = 2.955 square feet.

The output Q then is 2.955 x 2070 = 6120 cubic feet.

Taylor also uses the following formula:

$hQ/6345$ = horsepower output of fan.

h = impact pressure corrected for frictional loss in piping between Pitot tube and fan outlet.

Taylor's formula for frictional loss is

$$H = 2flv^2 \ (a+b)/ab$$

v = velocity in feet per second.

H = loss of head in feet of air.

f = coefficient of friction = 0.0001 for a wooden pipe.

l = length of pipe in feet.

a = length of long side in feet.

b = length of short side in feet.

The density of water is approximately 62.3 pounds per cubic foot = w.

Then one foot of water is equivalent to w/W feet of air, or one inch of water equals $w/12\ W = 5.191/W$ feet of air.

The loss of head in inches of water equals $Hw/5.191$.

v equals volume in cubic feet per second divided by 0.91 times the area of the pipe.

Substituting in the formula;

w = .074794

a = 1.802

b = 1.64

f = 0.0001

l = 17.2 ft.

$v = 6120/(2.955 \times 0.91 \times 60) = 38$ feet per second.

Correction for friction in inches of water equals

$$\frac{0.074794}{5.191} 2 \times 0.0001 \times 17.2 \times 38^2 \frac{1.802+1.64}{1.802 \times 1.64} = 0.0831$$

$h = 2.207 + 0.0831 = 2.290$.

Substituting in formula for horsepower Q = 6120.

2.290 x 6120/6345 = 2.215 horsepower, output of fan.

At the time air readings were taken, motor readings averaging as follows were taken. Line voltage = 120 volts; line amperes = 26; speed = 685 revolutions per minute.

This makes an output of

120 x 26/746 = 4.18 horsepower.

The set efficiency then equals

2.215/4.18 = .529 or 52.9 per cent.

The efficiency of the motor was calculated by the separate-loss method and characteristic curves of the motor are shown in Fig. 6.

At a 26-ampere load, the motor efficiency is 83.5 per cent and the horsepower output is 3.5 horsepower.

The fan efficiency therefore is

2.215/3.5 = 63.2.

The set efficiency and fan efficiency are therefore well inside the guarantees.

Motor Tests.—When delivering 6,000 cubic feet of air at 685 revolutions per minute the line current was 26 amperes. The heat run at 625 revolutions per minute was therefore made at 3.25 amperes, with the results shown in Table II, which covers all tests made on the motor. The temperatures were taken by means of centigrade thermometers placed under the tape on field and covered by waste on other parts. It is noted that on this test the motor is very cool. The test was run with a board over the blower inlet, which reduced the load to 32.5 amperes. With the blower inlet wide open the motor line current was approximately 50 amperes.

When the speed of the set was reduced by putting full field on the motor, the load with inlet and outlet wide open was 24 amperes and the speed was 570 revolutions per minute. The eight-hour heat run under these conditions shows that higher temperatures were developed than on the previous run, due no doubt to increased loss in shunt field and a decreased ventilating effect by the motor armature due to drop in speed. All parts are well within the specified limits by thermometer and the rise by resistance in the shunt field is inside the guarantees by a margin of approximately four degrees.

The rise is calculated as follows: Before any current is put into the windings a thermometer temperature t of the cold coil is taken. Current is then admitted and a cold resistance r is measured. After a heat run the hot resistance R is measured and the average room temperature for the last two hours of the run, T is noted. The rise by resistance B then equals

$$(238 + t) \ (R/r - 1)$$

From the total temperature rise thus calculated subtract the difference between the cold coil temperature t and the average room temperature T.

The rise thus obtained is to be further corrected by 0.5 per cent for each degree centigrade that the average room temperature differs from 25 degrees; the correction to be added if the room temperature is below and subtracted if above it.

The cold coil temperature was 18 degrees and the cold resistance was 129.4 ohms. The average room temperature was 21 degrees and the hot resistance (after full field run) was 148.8 ohms.

$B = (238 + 18) \ (148.8/129.4 - 1) = 38.4$.

21 — 18 = 3

38.4 — 3 = 35.4

25 — 21 = 4 or final correction should be made by adding 2 per cent.

Rise by resistance then equals

1.02 x 35.4 = 36.1 degrees.

When no-load readings were taken with the motor running free, the regulation at weak field was found to be flat, that is, the no-load and full-load speeds were the same. This is characteristic of an interpole motor properly designed, as are also the high light-load efficiencies.

The centrifugal test was made at 1,400 revolutions per minute as shown in Table II and the commutation was perfect with 50-per-cent overload at 685 revolutions per minute. The motor weighed 737 pounds and the blower 510 pounds or a total of 1,247 pounds.

The set was compact and rugged in appearance as is shown by Fig. 5.

Platinum.

Native platinum is really an alloy of platinum, iridium, rhodium, palladium, and often osmium, with varying amounts of iron, copper, and gold. It is usually found as small nuggets, scales, and rounded or irregular grains; its color is steel-gray. The specific gravity of the crude platinum varies from 14 to 19. The percentage of the metal varies also within wide limits, usually from 70 to 85 per cent.

Owing to its high melting point and great resistance to acids, platinum is extensively used for laboratory utensils. In the manufacture of sulphuric acid the metal has been used in making large concentration kettles, but of late gold has been substituted for it. In photography, dentistry, and electric installation much platinum is used. Of late the manufacture of jewelry has consumed large quantities of it. It is extensively used for chains and for the setting of diamonds, the claim being made not only that it is more resistant than silver and harder than gold but that the stones are better offset by platinum and appear larger than in any other kind of setting.

The present extensive use of platinum in the manufacture of jewelry is unfortunate, since other metals can be substituted for it, and this fad is undoubtedly one of the principal causes or the great increase in the price of platinum.

Electrification of Italian Government Railways.

According to an English newspaper, the administration of the Italian state railways is now considering a scheme for the electrification of a great part of its lines, and for a start proposes to electrify the 12-mile line from Rome to Ancone.

Water power from the falls of Terni and Fabriano will be utilized for the generation of the electricity, and it is stated that if the results of the working of this section prove satisfactory the administration intends to arrange for the gradual electrification of the whole railway system.

CONVENTION OF COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION.

Tenth Annual Meeting, Denver, September 12 to 14.

The tenth annual convention of the Colorado Electric Light, Power and Railway Association opened on September 12, at the Colorado Hotel, Glenwood Springs, and completed business on September 14. The convention was largely attended from all over the state and practically every central station was represented among the registered members. It was the consensus of opinion that the 1912 meeting was one of the most successful ever held by the organization, and the papers were of such value as to excite considerable interest and inject spirited discussion into the meetings. The entertainment was also of a variety that pleased.

The first session was called to order by the president, W. S. Robertson, in the ballroom of the hotel, at 2:30 on Thursday afternoon. The first business undertaken was the reading of the rules.

Central-Station Load Building.

The initial paper was to be presented by E. M. Fay, of the Westinghouse Electric & Manufacturing Company, the title of which was "Some Phases of Central-Station Load Building," but in his absence it was read by B. S. Manuel of the Denver Westinghouse branch.

For the most part, the paper was a discussion of the factors contributing to the load building of the central station, and the numerous small appliances were given particular attention. Mr. Fay stated that the application of electricity to the labor problems of the home was the sure and only solution of the domestic servant problem and its attendant evils. The application of power and the question of whether rates should be given the domestic consumer were thoroughly gone into, and, in the opinion of the writer of the paper, rates shou' i be given only when capacity and actual hours of use demand it.

There were three ways of getting a quantity of the small apparatus on the lines, and these as outlined by Mr. Fay were by attractive window displays, house to house campaigns to interest the consumer, and free installation of the appliances and extensive advertising. An outline of the different methods of displaying appliances was brought out and several cases where the central stations were co-operating with the manufacturers were cited. In connection with house to house canvass he enumerated, and displayed with stereopticon views, several forms used to index prospective customers.

That supplying power to consumers as cheaply and efficiently as possible would go a long way towards securing the good will of the consumers was amply brought out, and the author believed that until that was done the consumer and the central station would never be on a co-operative basis. A table showing the revenue to be secured from the application of the small electrical appliance, such as fans, irons, utility motors, percolators, and a number of others, in a community of 5,000 people was shown in a lantern view.

In the discussion which followed, J. F. Dostal and R. G. Gentry, of Colorado Springs and Denver, respectively, took a prominent part. The former said that experience in his city had proven that the older houses were not prepared for the reception of the smaller appliances, due to inadequate wiring. Until this could be overcome it was thought the small appliance would never come into its own. It was the belief of Mr. Gentry that prominent notice has not been made of the application of electrical energy to industries. The smaller appliances would tend to greatly popularize electricity and gradually educate the public up to a more varied and extensive use of current. The method employed by the Denver company in pushing the smaller appliances was explained.

Electric Vehicle, and Miscellaneous Uses of Electricity.

George D. Luther, contract agent of the Denver branch of the Electric Storage Battery Company, then read a paper on the "Electric Vehicle as a Source of Revenue to the Central Station." The amount of freight handled by wagons when compared to that handled by the railroads showed that the wagons were handling about twice as much as the railroads. This was cited as an example of the field which the electrically propelled machine has in commercial enterprise. He stated that the achievements of the electric vehicle in every-day service was its best advertisement and it had amply demonstrated its practicability. The Ironclad-Exide battery was extensively gone into, and in the opinion of Mr. Luther it was adding impetus to the popularization of the electric machine. Contrasting the comparatively few parts of the electric machine, the lesser depreciation percentage and the longer life with the same items on gas cars showed advantageously for the electric.

Figures showing the consumption of pleasure vehicles, light commercial cars, those of heavier capacity, and the heaviest types were given and when compared with the revenue derived from arc lamps, irons, fan motors and any number of other small appliances proved that the electric was a desirable class of business and quite profitable. The manufacturers of the Ironclad-Exide battery, it was said, maintained relief depots in the eastern parts of the country where discharged batteries were exchanged for freshly charged ones and this gave the electric greater, if not unlimited mileage radius, which compared favorably with other types of horseless vehicles.

"Are the manufacturers co-operating with the central stations in the matter of pushing the sale of the vehicles?" was the question brought up in the discussion that followed. It was generally agreed that they had not done so in the past, but at present a general interest was being aroused. Where there are 15 makers of gas equipment in the field there is only one electric manufacturer, and this was accredited as one of the reasons why the gasoline car had made greater strides than the electric car. The performance of machines in the employ of several of the companies was brought out and the general sentiment seemed to be that the electric was efficient in every respect. The difficulty of starting the sale of electric vehicles was brought to the floor and the opinions expressed seemed to concede this fact, but it was stated that this condition is being largely overcome.

In the evening at 7:30, A. W. Hahn, commercial manager for the Northern Colorado Power Company exhibited a moving picture taken expressly for that company to advertise its commodity in the northern section of the state. The plot was along the line of a tenderfoot coming west in the hope of making a fortune out of farming, but on arriving found nothing but barren plains. It then proceeded to show how the application of electricity was tending to revolutionize farming in Colorado and actual installations of motors to farming machinery was shown. These included views of motors on pumps, others connected to machines for grinding a specially prepared food for cattle, of which there are somewhere in the neighborhood of half a million fattened for market in that section of the country every year. The installation of electrical implements in the rural homes was also exhibited.

The Westinghouse Company's moving picture, "The Education of Mr. and Mrs. Thrifty," followed. This film was recently shown at the convention of the National Electric Light Association as one of the power companies'. Each were well received by a large audience.

Upon the opening of the Friday session the nominating committee was appointed by the president, and after this procedure H. F. Holland, of the Simplex Electric Heating Company, gave a talk on "Electric Cooking and the Field It Offers to the Central Station." According to Mr. Holland the electric range is just beginning to wield a dominating influence in central-station destinies. It is the perfection of all methods of cooking, and it could be employed at a very economical rate. Its

improvement over coal, wood, oil, and even gas is self-evident both from the sanitary point of view and that of convenience. Its efficiency is even greater, and in comparing the electric oven with a gas range the superior features of the former were pointed out. For instance, it was related that air had to be admitted to the gas oven in order that the burned gases might be removed, but this was a feature entirely lacking in the electric oven. One could bake bread or pastry to the right turn without the customary plan of inspecting the progress of baking. Meat can be roasted without basting and with absolutely no regard as to its ultimate finish, with the electric oven. The electric range assures a finished product.

Regarding the competition of the range with gas, it was stated that current could be sold at 3.40, 2.83 and 2.27 cents per kilowatt-hour in places where gas sold for $1.50, $1.25 and $1.00 per 1,000 feet, but as these statistics were taken at sea level they were not considered as strictly applicable here.

As the electric range is just beginning to find an extensive field in this district, a lengthy discussion was gone into and the experience of the several companies installing ranges was cited. The Northern Colorado Power Company has had much success in installing electric ranges. A. H. Hahn told of a demonstration of the range given at the Boulder office of the company, at which an attendance of about 1,500 was present. The company gave actual demonstrations of the range at work and cooked several roasts and hams and served them to the ladies attending the reception. As a result of this campaign 35 ranges were sold.

In relation to the rates charged for the current the custom in Colorado seems to be that of charging three cents per kilowatt-hour and another is 3.5 cents a kilowatt-hour with a minimum of $1.25 per month. The practice of the Twin Falls (Idaho) company, it was said, was to charge a rate of 3.5 cents a kilowatt-hour with a minimum of $2.40 a month and a guarantee by the central station that the bills would not run in excess of $4.80 for any one month. Mr. Hahn, of the Northern Colorado Power Company, said that some times his company allowed the readiness-to-serve charge paid by the consumer on power and lighting installations to apply on current used for cooking, thus allowing the farmer the one readiness-to-serve charge, plus his current consumption for cooking.

Voltage Regulation on Lighting Circuits, and Other Notes.

The next step in the convention's progress was the reading of a paper prepared by Robert E. Campbell, of the National Quality Lamp Division of the General Electric Company, on the proper lamp for the circuit. Conditions surrounding the transmission of energy and plant operation had a great deal to do with the selection of a proper lamp for the circuit, he said. His paper was of a statistical nature and was compiled from data gathered in a number of the Eastern states. He defined the various causes of fluctuations of voltage at the consumer's premises and said that one case of this kind encountered showed a loss of four volts on a 120-volt circuit.

Some very striking figures concerning the effect of the revenue of the central station of maintaining the proper voltage at the lamp were given, on the assumption that out of $400,000,000 income to the central stations in the United States, $275,000,000 was derived from lighting and that if the voltage drop in each station could be reduced two per cent the increase in revenue would be $11,000,000. He then gave some figures showing the economy of lamps operating at under voltage. For example, he said that if a lamp is burned at one per cent under voltage, the maximum economy will result. He also gave several illustrations showing how an increase in per cent in under voltage tended to increase the central station revenue.

In the discussion the fact was brought out that an increased use of small electrical appliances would have a tendency to decrease fluctuations, this following a declaration that it was a hard matter to regulate voltage at the customer's houses. J. F. Dostal contended that it was not enough for the central station to be satisfied with its service if complaints were infrequent and called attention to an experience of his at Colorado Springs. He stated he had recently made a test of the voltage in 126 blocks in his city, and, although the company had never received any complaints concerning low voltage it varied from 100 to 120 volts. He declared that it was the business of the company to anticipate complaints at all times, and a constant watch of voltage conditions should be adhered to. The test he had taken at Colorado Springs came at an opportune time and but a few days after they had been made and conditions restored to normal he received a visit from the city's engineer in regard to low voltage. He informed the engineer he would be glad to co-operate with him in every way, supplying men and the necessary implements, and the engineer was surprised at his attitude. Mr. Dostal informed him that he had just completed an investigation of voltage conditions and he was glad to have him go over the situation. The matter was dropped and it was cited that this was ample indication of how the central station should be prepared for just such emergencies. W. N. Clark, of the Pueblo Lighting Company, said that his company ahd been installing voltmeters on all customers' premises and the results were satisfactory so far.

At this juncture S. E. Doane, chief engineer of the National Electric Lamp Association, of Cleveland, and a prominent member of the rate research committee, who with G. E. Merrill of the same company, was in attendance, was called on by the chair for a few remarks. Mr. Doane gave an interesting but brief talk on the work of the rate research committee and its ultimate benefit to the central station.

An actual demonstration of a Drager's Pulmotor belonging to the Denver Gas & Electric Light Company was then given by Harry Wickstrom, of Denver. He showed its use in the resuscitation from the effects of electric shock, asphyxiation and drowning. In his talk he used a rubber tube as an illustration of the oxygen action in the lungs and stated that it made no difference as to sizes of lungs, as the pulmotor automatically adapted itself to the condition. Several cases where doctors had given up persons overcome with gas or electricity were cited, and in every case the pulmotor had been called into action, and saved life.

A stereopticon lecture on "Industrial Loads" was then taken up. The paper was read by W. S. Harrison of the Westinghouse Company, its author. The views showed the application of electricity to industrial enterprise and explained that from 1906 to 1910 there had been an increase of from 10 to 67 per cent in the application of electrical energy for industrial purposes in ten different businesses.

In discussing this paper one of the members stated that his company had already commenced applying electricity to industrial loads and a number of flour mills, sugar factories, railroad shops and other businesses had either considered installing this form of drive or had already done so.

"Boiler Efficiencies," by A. B. Carpenter, of the Pueblo and Suburban Traction and Light Company, came next and, in the absence of Mr. Carpenter, was read by W. N. Clark of the same company. It showed that boiler efficiencies in the Western sections, according to data, showed an efficiency of only 50 per cent, but that it was possible to obtain an efficiency of 70 and 75 per cent. The low grade of the Western coal was responsible for this low efficiency. In the Canon City plant of one company it was said individuals handling coal and steam were taught to regard it as a percentage of a dollar and this was largely responsible for the excellent conditions found there.

As most of the members in attendance at this session were from companies securing energy from hydro-electric systems, there was not an extensive discussion on the subject.

Executive sessions were held on the afternoon of Saturday, and at this time a motion to adopt the plan of the Na-

tional Electric Light Association on the assessment of company members was entertained and discussed, but, as a definite plan could not be decided upon, the matter was referred to the incoming officers. A campaign to add new members to the association was also launched. W. N. Clark, superintendent of the Mountain Division of the Arkansas Valley Light, Power & Railway Company, was elected president. He is a graduate of Illinois University and the Colorado School of Mines, and is also an associate member of the American Institute of Electrical Engineers. His connection with the electrical industry dates back from 1898 and he has been in Colorado all of that time.

The other officers elected are W. C. Sterne, Denver, vice president, and T. F. Kennedy, also of Denver, secretary-treasurer. The next meeting place will be chosen by the new officers at a later date.

The entertainment features of the convention of the Colorado electrical men was of a variety that proved very popular with members and ladies. The introduction of all members and guests was the first thing undertaken by the entertainment committee on Thursday evening. In the afternoon the delegates enjoyed a plunge in the pool which was complimentary of the management of the Colorado Hotel. Practically every member took advantage of this opportunity and as a result the pool was filled during the entire afternoon after the business sessions had recessed.

On Friday morning about 50 of the ladies and gentlemen took an eight-mile horseback and stage ride to the Cave of the Fairies. This proved a hit. The same afternoon the entertainment committee offered a number of prizes for those that excelled in a number of different feats in the swimming pool. Prizes donated by the attending delegates were offered and the competition for them proved to be thoroughly amusing to the onlookers and a source of much enjoyment to the participants. At 8:30 o'clock Friday evening a ball was given in the ballroom of the hotel. This lasted until a little after midnight.

Saturday, September 14, was the last day of the meeting and a trip to Eagle Canon, one of the numerous beautiful scenic trips in the vicinity of Glenwood, was planned, as was an excursion to the power station of the Central Colorado Power Company, at Shoshoni. On account of bad weather both were abandoned.

Wireless in Norway.

The Marconi Company announces that a contract has been signed with the Norwegian Government for the erection of high-power stations in Norway for the purpose of conducting a commercial telegraph service between Northern Europe and the United States.

THE PRODUCTION OF CHLORINE FOR WATER AND SEWAGE STERILIZATION.[1]

By Joseph Race.

Chlorine is being so largely used at the present time for the treatment of drinking water and sewage that a review of the different methods used in its production will be of general interest. Almost the entire quantity used at present is made either from bleach or by the electrolysis of brine solutions, and as the latter are becoming more prominent, they will be described.

When electricity is passed through a solution of common salt, the sodium-chloride molecule is dissociated and the components liberated. If these are not separated, the chlorine combines with the sodium hydrate formed by the action of the sodium on the water present, to form sodium hypochlorite, a strong germicidal agent. There are two types of electrolyzers used for the process. In one, the cathodic and anodic products are allowed to recombine in the main body of the electrolyte; in the other, the diaphragm process, the products are removed separately from the cell as produced. For the production of sodium hypochlorite, the non-diaphragm process has usually been adopted because it dispenses with the destructive diaphragms and the loss of energy that such diaphragms cause. Dr. Rideal, of London, England, has recently developed a cell of this type with an energy efficiency of 68 per cent, but as complete data are not available, the non-diaphragm process only will be dealt with.

The theoretical voltage required for the decomposition of sodium chloride is 2.3, but when the products recombine in the electrolyte, side reactions occur which raise the minimum voltage to 3.54. On this basis one kilowatt gives 272 amperes, and as one ampere-hour is theoretically capable of producing 1.28 grams of chlorine, 1.26 kilowatt-hours are necessary for the production of one pound of chlorine by the decomposition of 1.65 pounds of salt; this represents an energy efficiency of 100 per cent.

Charles Watt (1851) was the first to patent this process and to recognize the necessary conditions, which are: (1) insoluble electrodes; (2) low temperature of electrolyte; (3) rapid circulation of electrolyte from cathode towards anode. The temperature is very important, for, if it reaches over 25 degrees centigrade, oxidation takes place, and the efficiency is lowered. The following types of electrolytic cells are now in use in various places.

The Haas and Oettel Electrolyzer.—The latest form of this electrolyzer makes use of carbon as electrode material for the liberation of hydrogen at the cathode to effect automatic circulation and mixing of the liquid in the cell. The inner or working cell is a rectangular stoneware tank divided by the carbons into thirty narrow compartments or cells, each of which has one hole at the bottom and two others at the sides about two inches from the top. The first and last carbons of the set form the main electrodes of the cell; the intervening carbons act as secondary electrodes, i. e., as anodes on the one face and cathodes on the other. This inner cell is supported on a brick foundation within a stoneware tank measuring 72 inches by 36 inches deep and is filled with a 15 per cent solution of brine to within four inches of the top. The carbons are protected at their top and bottom edges with slips of glass of the same width as the carbons, which prevent short-circuiting due to dirt and sludge, and also prolong the life of the carbons. A continuous current of 80 amperes at 100 volts is employed to work the electrolyzer, and as soon as the electrical connection is made the evolution of hydrogen at the negative or cathode surface of the electrodes causes the level of the liquid within the cells to rise above the overflow pipes, and a rapid circulation of the brine occurs, fresh liquid flowing in at the bottom of the cells. The liquid passing away at the top of the cells flows over a cooling plate, and when necessary the heat produced by electrolysis is further dispersed by aid of cooling pipes placed in the layer containing tank.

Capacity, 165 gallons of brine. Strength, 15 per cent.

Salt required, 247.5 pounds.

Current, 75 to 80 amperes at 110 volts for ten hours or 88 kilowatt-hours.

Yield, 165 gallons hypochlorite solution containing 14 grams of free chlorine per liter (1.4 per cent) equivalent to 23.1 pounds of chlorine.

The carbon electrodes are reported to have a life of 18 months for a 10-hour working day. The current efficiency falls from 95 to 52.8 per cent during the ten hours required to produce a solution containing 14.0 grams of chlorine per liter, the highest efficiency being obtained with a concentration of 2.5 grams.

The Kellner Electrolyzer.—This consists of a shallow stoneware tank divided into a large number of narrow cells by means of vertical glass plates so arranged that the electrolyte is obliged to take a zig-zag course in its passage through the electrolyzer. The electrodes are formed of platium-iridium gauze, and are arranged horizontally with anodes below the cath-

1 From *The Canadian Engineer*.

odes, so that the chlorine liberated at the former may be absorbed by the supernatant liquid. This electrolyzer has only two terminal electrodes, and all the intervening electrodes function as secondary electrodes as in the Haas and Oettel apparatus. The electrolyzer is constructed usually to take a current of 110 volts. Brine is passed continually through the apparatus until the desired concentration is obtained, a small centrifugal pump being employed to circulate the brine through the electrolyzer and an external cooling vessel being used to keep down the temperature below 25 degrees centigrade. Using a 10 per cent solution of salt, the current efficiency falls from 87.5 to 45.8 per cent, in 10 hours, the free chlorine rising from 0.309 to 1.295 per cent during this period.

Capacity, 820 liters (180 gallons) of brine. Strength, 15 per cent. Salt required, 270 pounds.

Current, 90 amperes at 110 volts for 10 hours, or 99 kilowatt-hours.

Yield, 180 gallons of hypochlorite solution, containing 20 grams free chlorine per liter (2 per cent), equivalent to 36 pounds of chlorine.

The life of the plantinum-iridium electrodes is, of course, much longer than that of the carbon electrodes employed in the Haas and Oettel electrolyzer, and their scrap value is considerable; but, on the other hand, they are not indestructible, and if the brine contains magnesium salts, the deposit of these causes trouble.

The Hermite Electrolyzer.—The distinctive features of this cell and process are the use of a mixture of sodium and magnesium chloride as electrolyte, of magnesium hydrate as a preservative, and of zinc as negative element in the cells. The electrolyte is prepared in an elevated tank, and is allowed to flow by gravity through a series of four double troughs. These troughs were formerly made of slate, but are now constructed of glazed earthenware, and each is divided by a partition which causes the electrolyte to pass twice along the length. Each division of the trough contains five sets of electrodes, two negative electrodes of zinc inclosing one positive electrode formed by winding thin platinum wire upon a perforated porcelain slab of the required shape. There are thus six separate cells containing 40 pairs of electrodes in the one unit of plant, and a current of 15 amperes at 230 volts is employed, the electrodes and cells all being connected electrically in series. The electrolyte passes between each of the electrodes in its passage from the inlet to the exit, the flow from one trough to the next being controlled by glass syphons and funnels. A small addition of sodium hydroxide solution is made to the liquid as it flows from the last trough, glass carboys being employed to receive the mixed solution of calcium and magnesium hypochlorites. The capacity of each unit of plant is 185 to 200 gallons of solution at a strength of 4 to 6 grams of chlorine per liter (0.4 to 0.6 per cent) per eight-hour day, the rate of flow of electrolyte being 3.3 pints per minute. The first unit of plant was erected at Poplar in 1906, and cost with all the necessary accessories $2,915, the second unit erected at the beginning of 1910 cost $2,505. The running cost—electricity, water, chemicals, supervision and testing—for the half-year ending September 30, 1910, amounted to $500, but this total does not contain any allowance for interest, depreciation, rent, or distribution charges.

The Vogelsand Electrolyzer.—The original form of Vogelsand electrolyzer resembled in its main construction features of Hermite and Kellner electrolyzers, the electrolyte being made to take a zig-zag (vertical) course through a trough filled with a large number of electrodes (secondary). Lead plates faced with platinum on the anode side were used as the intermediate electrodes, and by varying the number of these the electrolyzer could be made to take a current of 85 amperes at 65 to 110 volts. An electrolyzer of this type was said to have produced 44 pounds of active chlorine in a 10-hour working day, equivalent to an energy efficiency of 35.8 per cent. The use of lead for electrodes did not, however, prove satisfactory, and the Vogelsand cell has been considerably modified. The electrolyzer now worked at Nottingham and other places abroad is constructed with composite electrodes. Narrow bars of slate extending the full width of the cell are wrapped with a sheet of platinum-iridium foil in zig-zag fashion, the result being an electrode of great strength, which can carry high current densities, and presents opposing surfaces of foil where required. The sectional area allowed for carrying the current through the electrode (from one face to the other) should be proportioned to the superficial surface in contact with the electrode.

The Mather and Platt Electrolyzer.—This resembles that of Kellner, and is constructed with 39 electrodes made of a platinum-iridium alloy, and with two terminal electrodes for connection to the current mains. The 40 cells into which the electrolyzer is divided by plate-glass strips are so arranged that the electrolyte takes a zig-zag course, and attains a strength of 7 grams of chlorine per liter (0.7 per cent) at the exit of the electrolyzer. A current of 19.3 amperes at 2.2 volts for 10 hours is stated to yield 15.4 pounds of active chlorine, equivalent to 2.7 kilowatt-hours per pound of active chlorine. The strength of salt solution used is 6 per cent, and cooling tanks are employed both for the brine and the electrolyzed liquor.

The Dayton Cell.—This consists of a shallow earthenware tank, containing two carbon electrodes and a number of baffle plates to direct the course of the continuous flow of brine solution. The glazed stoneware tank is practically indestructible and the renewal of the electrodes, which have a life of from 12 to 18 months, is but a trifle.

Rickard's Quarterly Bulletin, Ohio State Board of Health, October-December, 1909, states that with this cell one pound of available chlorine could be produced by the consumption of 2.65 kilowatt-hours and 6.9 pounds of sodium chloride. This result was obtained by cooling with ice. Without the cooling process, 3.62 kilowatt-hours and 7.2 pounds of salt were necessary. Other results with this cell are to the effect that one pound of available chlorine can be produced by the consumption of 3.38 kilowatt-hours and 7.7 pounds of salt. The cell using 20 gallons of 5 per cent salt solution per hour gave a liquor containing 0.65 per cent of available chlorine by the consumption of 40 amperes at 110 volts.

The cost of production will depend upon local circumstances. If alternating current is available at $30 per horsepower per annum, the price per kilowatt-hour of direct current, assuming the efficiency of a motor-generator set to be 88 per cent, will be 0.52 cent. With low-grade salt at $5 per ton, the cost of one pound of available chlorine would be as follows:

Cost of Pound of Available Chlorine.

Type of cell	Salt	Current	Total
Haas and Oettel	2.67	1.97	4.64
Kellner	1.87	1.43	3.30
Hermite	2.80	1.49	4.29
Dayton	1.92	1.76	3.68

From the results it is evident that the most efficient cells are the Kellner and the Dayton, but as the former involves a much larger capital outlay owing to the high cost of the platinum-iridium electrodes, the latter is the most economical cell available. Low-grade salt is often unsuitable for use in the Kellner cell.

Earliest Production of Steel.

The first steel produced in this country was probably made in Connecticut in 1728 by Samuel Higley and Joseph Dewey. Crucible steel was first successfully produced in the United States in 1832 at the works of William and John H. Garrard, at Cincinnati, O. Bessemer steel was first made in this country in September, 1864, by William F. Durfee at an experimental plant at Wyandotte, Mich., and open-hearth steel in 1864 by the New Jersey Steel & Iron Company, at Trenton, N. J.

The 1912 Boston Electric Show.

Announcement is made that preparations are about complete for the opening of the 1912 Boston Electric Show. The show is under the management of Herbert W. Moses, who has been connected with the Boston Edison Company since the spring of 1903, occupying consecutively the positions of special agent, head of the city sales division of the sales department, and head of the illuminating engineering division of that department. He has recently been made chief of the company's new bureau of welfare work. The advertising department has been in charge of L. D. Gibbs, who has been with the Boston Edison Company about the same length of time as Mr. Moses, and he has been connected with the offices of the company all of that time. He is now connected with the advertising department.

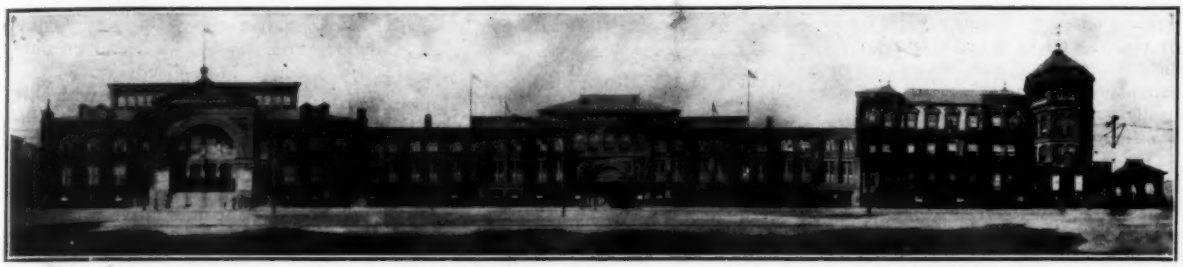
The show will be held from September 28 to October 26, in the Mechanics Building, one of the largest permanent exposition structures in the country. The management has been working steadily for two years, and the investment when the doors open in preparatory development and publicity will approach $200,000.

The plans for the street illumination and special illumination of the Mechanics Building are very elaborate. For a mile, from Copley Square to Massachusetts Avenue, Huntington Avenue will be a blaze of light. Special decorative lighting effects have been produced. Down both sides of the avenue will be forty-four artistic lamp fixtures; two fixtures at either end of the stretch will each carry thirteen special flame arc lamps; the remaining forty fixtures will each have four big arcs. Remarkable color lighting effects will be secured from these lamps by the use of special carbons made for the first time for use at this show.

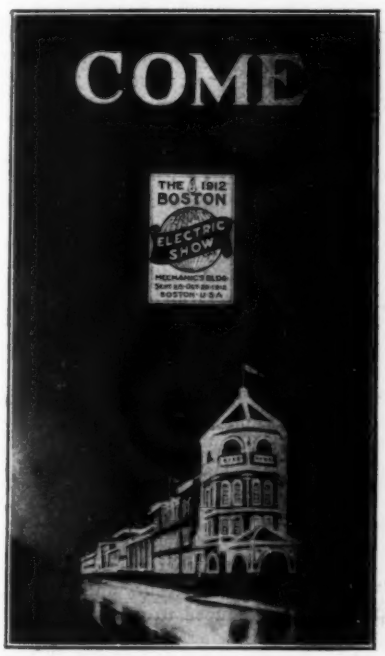
The outside of Mechanics Building will be outlined and illuminated with 30,000 incandescent lamps of different colors and special designs in mosaic effects.

Special plans have been made for the certainty of the service and the evenness of the lighting effects by the installation of ample substation equipment. In addition to the regular and ample direct-current service a temporary substation has been built on West Newton Street at the rear of Mechanics Building, which will supply alternating current needed during the show. This station will be fed by taps from one of the 13,200-volt transmission cables. The station will be equipped with a bank of three 500-kilowatt transformers stepping down from 13,200 volts to 2,300 volts. There will also be one 100-kilowatt, three-phase transformer, five 50-kilowatt transformers, and one 30-kilowatt, stepping down from 2,300 to 230 volts. This will supply the service for the underground secondary mains running from the substation through the building. There will be a 2,300-volt, primary circuit leaving the substation, running via poles set in the rear of the building, to supply one 50-kilowatt, four 30-kilowatt, and two 20-kilowatt transformers, from which overhead services will be run into the building.

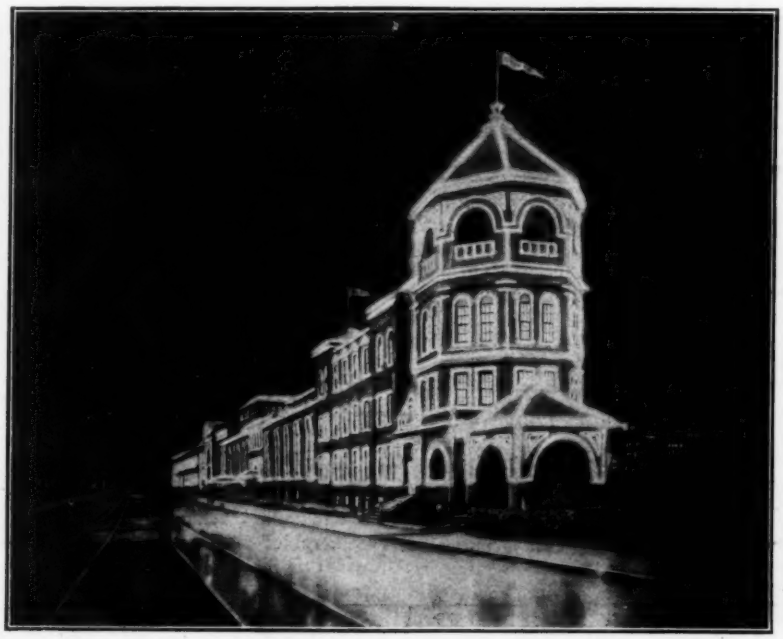
For the interior decoration beautiful effects have been secured by the use of fireproofed, decorative materials, and by the lavish application of the brushes and paints of talented and high-priced artists.



View of Mechanics Building Where Boston Show Will be Held.



Posters That Are Being Widely Distributed.



Special Illumination of Mechanics Building.

The whole scheme is classic and simple in design. Grand Hall is typical of a substantial German village, the effect being borne out by the gallery construction and designs of the decorations for the exhibit booths on the main floor. The Electric Vehicle section bears out the illusion of an open park, with boulevards, trees, and park lighting effects. Here are shown highways where the heavy traffic is carried on by means of electric trucks, and winding arborways, drives and parkways for the electric pleasure vehicles. Machinery Hall bears out the illusion of a large factory, with brick walls, open windows and ample illumination, characteristic of the electrically equipped manufacturing establishment. The galleries and broad halls of the second floor conform in their decorations to the character of the exhibits; the same is true of the large spaces in the basement.

In the basement will also be found a completely equipped electric garage. Here the demonstration cars of the exhibitors will be kept, and provision has also been made for garaging the business cars the exhibitors are using. This will be done in order to give visitors to the show an opportunity to see, not only cars on exhibition and cars reserved for demonstration, but also trucks and pleasure vehicles that are in regular, efficient, daily use.

Three hundred central stations in New England are co-operating in carrying out this show, because of the educational effect it is certain to have upon the people in the territories they serve, and because the benefits from this educational influence must accrue directly to the electric lighting business. Along with these central stations in hearty co-operation are the manufacturers, supply dealers and wiring contractors.

Over 200 exhibitors have arranged for representation, covering every phase of electrical and kindred industrial development.

Aerial Navigation and Wireless Telegraphy.

In the address of Hon. William C Sharp, of Ohio, in the House of Representatives, at Washington, August, 1912, while advocating an appropriation for aeroplanes and aeroplane experiments, the following interesting statements were made:

"The world a few years ago was startled by the discovery of a mere boy over in Italy when he announced that he was able to send messages through the air without the use of a wire. It is interesting to read an account of how he first came to discover the properties of wireless telegraphy, if I may call it by that name. Marconi at the age of 15 was already a scientist and an expert in the knowledge of electricity. But wireless, telephone, radium, the spectrum analysis, the X-ray, even light itself, owe their power of manifestation to what? Why, to the fact there is a medium which scientists call ether, through which these waves are conveyed. Without that medium there could not have been made known to us a single attribute of the solar energy, the phenomena of the great sun—the producer of all our energy; take from this earth the ether itself and we could not have any communication of the electric current; we could not have any communication of the light waves that travel 186,300 miles a second. The contributor of the article on the discovery of the wireless states that it is a similar wave which sends a current on the wings of the air to the light waves.

"The real merit of the discovery of the Roentgen, or the X-ray, lies in the fact that the X-rays are not natural in actual existence but light waves are. Through all these ages man has been in the condition of a bird in a cage, confined to the surface of the earth. Given a little more stability and safety in the field of aviation, when the scientist can mount above the clouds with his finely constructed instruments, I predict here and now, gentlemen of the House, that almost at every ascent he will discover new conditions in regard to the science of meteorology; that he will acquire a vastly increased knowledge of the properties of this mysterious ether, and even of the silent but all-powerful forces of gravity and magnetic action.

"Let me tell you of a very astounding incident, if I may say that anything in this great age of discovery is any longer astounding. A gentleman who had his aeroplane at Minneola field, the other day told me of an incident that out-Verned Jules Verne in its strangeness. He said that a gentleman who had been conducting investigations along certain scientific lines came up to his machine and fastened upon one side of it a little instrument occupying less than a cubic foot in space, and then he said to the pilot. 'When you have gotten up several hundred feet in the air with your machine I will wave my handkerchief and then I want you to press this button upon the little instrument.'

"Just before this he had gone several hundred feet away, and in a little excavation in the earth he placed some powder, after which it was covered over with several inches of dirt. When the machine arose several hundred feet in height he waved his handkerchief, the operator pressed the button, and this powder ignited. Is there anything stranger in the realm of dreams than that? Is there any wonder that the gentleman who built that machine asked, after that incident, 'What is to prevent your blowing up any magazine when you fly up in the air and send down that mysterious current?' And the reply was that it could be done if the instrument was sufficiently powerful and properly attuned.

"Mr. Speaker, it is because of my firm conviction that through the practical investigations which we can carry on by a further development of the science of aviation we shall achieve most important results along the lines I have discussed that I stand here today advocating that in every possible way the Government stand behind and encourage this new field of discovery.

"It is with this thought and with this purpose that I have asked the kind indulgence of my colleagues upon this floor, and if it may result in some agitation, in some examination of a subject that is so comparatively new, I shall feel amply repaid for my efforts."

A New Method of Amalgamating Battery Zincs.

Large quantities of zinc are used in making batteries. In order to obtain a uniform and regular action, it is necessary to amalgamate the zinc with mercury. The old method of doing this was to coat the surface of the zinc over with mercury, but of late it has been customary to add metallic mercury directly to the molten zinc. About 3 per cent of mercury is used.

John Beattie, of Leete Island, Conn., has patented a method of amalgamating zinc for use in batteries which differs from the customary process. Instead of adding the mercury directly to the melted zinc, he first makes an alloy of mercury and sodium and then adds this to the melted zinc. About 96 per cent mercury and 4 per cent sodium are used and this small amount of sodium is capable of hardening the mercury so that the mass is solid and may be broken up.

The advantage of the mercury and sodium alloy over mercury is, the inventor states, on account of the small loss which occurs through volatilization. With the mercury, although 3 per cent may be employed as the addition, a considerable quantity volatilizes and escapes. With the mercury and sodium alloy, this is reduced to a considerable extent. From 2 per cent to 3 per cent of the mercury and sodium amalgam or alloy are added to the zinc, and owing to the less loss, a greater quantity remains in the zinc when cast.—*Brass World.*

Hydroelectric power is so readily available in Switzerland that it has been found expedient to heat electrically many buildings, particularly those that are not in continual use. Several churches are thus very successfully heated.

New Electrical and Mechanical Appliances

New Magna Specialties.

The Sachs Laboratories, Incorporated, 103 Allyn Street, Hartford, Conn., has recently placed upon the market the Magna adjuster, which is illustrated in Fig. 1. This adjuster is an exceedingly simple fitting which can be attached to any drop light with a flexible cord, and serves to maintain the lamp at any desired height. It is constructed entirely of porcelain and operates on the principle of a double-pulley tackle, using a stationary and a movable pulley block. The parts of the adjuster unassembled are shown in Fig. 2. The adjuster is easily and quickly placed on the flexible cord, which is clamped in the upper block, passes around the sheave of the lower block and then over the upper block, returning through a central channel in the lower block, through which it passes freely. The upper block is held by supporting chains, which remove all strain from the rosette and cord. Socket, lamp and shade combinations of any weight up to two pounds can be perfectly balanced by suitably weighting the ball counterbalancing member which forms the lower pulley. Superior insulation and safety are assured by the porcelain construction with glazed cord channels, which eliminates friction and abrasive action. A white or dark brown glaze can be furnished and the metal parts are nickeled, producing a pleasing effect.

Another method of counterbalancing the lamp consists in the use of the Simplex counterbalance. This consists of a two-part insulating clamp, which is attached at a suitable distance from the socket and is connected to a weight by means of a suspending cord passing over a swivel and a fixed pulley attached to the ceiling. This counterbalance is put on the market by the same company.

The Magna clip is shown in Fig. 3, next page. It is a single-piece punching of resilient insulating material provided at one end with two curved clip arms which engage the neck of the socket, and at the other end with a small curved hook which engages the flexible cord when the lamp is to be held horizontally and the light directed downward. It may remain permanently attached to the socket whether engaging the cord or not, but can be instantly removed or attached.

This figure also shows the Magna reflector in use with the lamp. This reflector is simple, light and inexpensive. It is made of a single struck-up piece of metal conforming to the shape of the bulb and extends slightly more than half way around, with petticoat overlapping the socket. It is attached directly to the bulb, from which it is held at a suitable distance by an extension, on the inner surface at the tip end. A projecting clip at the other end grips the neck of the bulb about one-half inch from the base. It can revolve about the lamp and direct the light in any direction required.

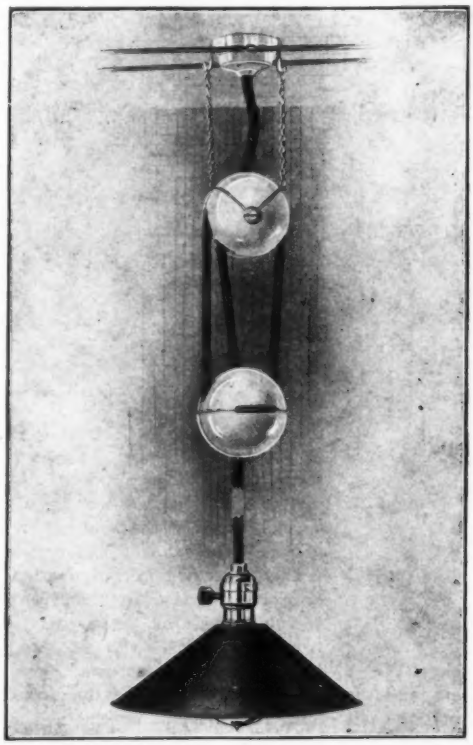


Fig. 1.—The Sachs Magna Cord Adjuster.

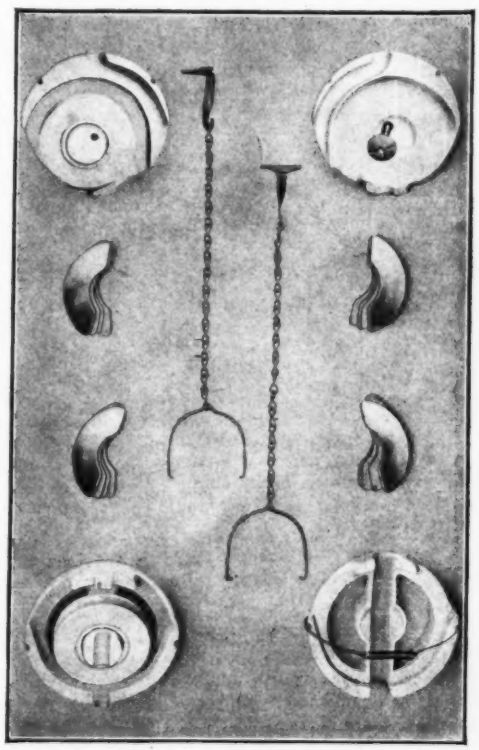


Fig. 2.—Adjuster Parts Unassembled.

The Chrono-Kinetograph Demonstrated at Philadelphia.

The initial demonstration of the Chrono-Kinetograph, a speaking and moving-picture apparatus invented by Isadore Kitsee, was made at St. Timothy Hall, Philadelphia, on September 16. A large audience enthusiastically watched and listened to a most successful performance. The demonstration was made under the auspices of the Cort-Kitsee Company.

Dr. Kitsee, the inventor and patentee of the Chrono-Kinetograph, made his first attempt to master a device for the development of speaking-moving pictures in the year 1905. In his laboratories in Philadelphia he first produced films in which, through a chemical process, the exact spacing was attained. Later on he used electromagnetic means for this purpose evolving his present device, which may be applied to any of the existing types of projecting machines, synchronizing the same with any existing types of phonograph machines; in other words, given a picture house already equipped with a projecting machine Dr. Kitsee is able to synchronize

Fig. 3.—Sachs Magna Reflector and Clip.

the same with a phonograph of any type desired, either of his own invention or any of the machines already on the market.

Physician's Electrical Cabinet.

Every physician knows the value of many forms of electrical apparatus in therapeutics, but also realizes that the purchase of each one would involve a large investment of money and expensive storage space.

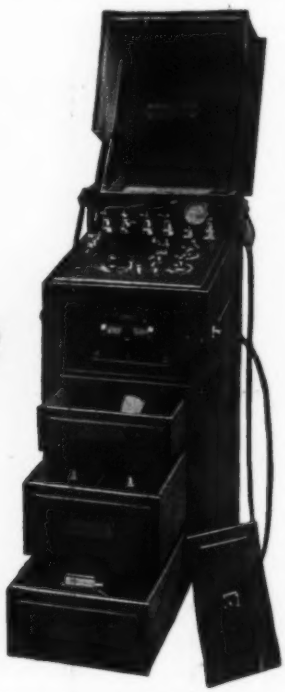
These difficulties are, however, overcome most happily in the compact cabinet illustrated herewith. This device provides, among many other conveniences, a vacuum apparatus, a hot-air douche, compressed air without the use of a tank, and vibration upon an entirely new principle. It weighs less than 100 pounds, but places the physician in a position to take care of patients himself, whom he would otherwise be compelled to send elsewhere.

The vibration, so essential in modern therapeutics, is obtained by causing air to pulsate against a thin disk or diaphragm at the rate of about 5,000 times a minute. This action is claimed to resemble nature more nearly than does any other device.

The compressed air and the vacuum obtained are produced by means of a unique fan or blower attached to a one-tenth-horsepower motor operating at 1,700 revolutions per minute.

Among other electric functions performed by this device are the furnishing of what is known to the medical profession as galvanic, faradic and diagnostic lamp currents when used on 110-volt direct-current circuits and sinusoidal, instead of galvanic, current when used on a 110-volt alternating circuit. The former can then be furnished through a rectifier.

The cabinet complete with its acces-



Physician's Electrical Cabinet.

sories is made by the Siebert-Welch Company, of Columbus, Ohio, and the electric motor for operating the air pump is made by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

New Type of Street Car.

A new type of street car has been designed by John Lindall, superintendent of rolling-stock of the Boston Elevated Railway Company. It consists of two single-truck cars connected by a spacious vestibule, which affords means of entrance and exit to either compartment. The car carries the prepayment equipment, the conductor standing at the center whence he has a full view of the passengers. He also is able to regulate the trolley from his position in the vestibule. Advantages claimed for the new car, known as the "articulated" car, are its greater safety, comfort and convenience. It is particularly well adapted to traverse the narrow streets and sharp curves of the city streets. The total length of the car is 63 feet, and although the weight is greater than that of the new prepayment cars recently put in use by the Elevated Company, the weight is so distributed that it may safely cross all bridges, although designed for lighter cars.

A New X-Ray Pendent Reflector.

The National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, claims a very high efficiency and unusual permanency for a new "X-Ray" reflector intended for drop cord and bench lighting in shops, over counters and work tables, for all kinds of localized lighting, and for general illumination from comparatively low ceilings, as, for instance, bowling alleys, basements, store

X-Ray Reflector No. 555.

rooms, and corridors. It is constructed of glass in one piece. The vertical and spiral corrugations produce an almost perfect diffusion. A coating of elastic enamel protects the silvered reflecting surface from cracking and deterioration.

This reflector meets a demand for a distributing type of reflector for 25-watt and 40-watt Mazda lamps. At 30 degrees from the vertical, with a 40-watt lamp, it delivers 94 apparent candlepower. The reflector is 6.375 inches in diameter and 5.125 inches high.

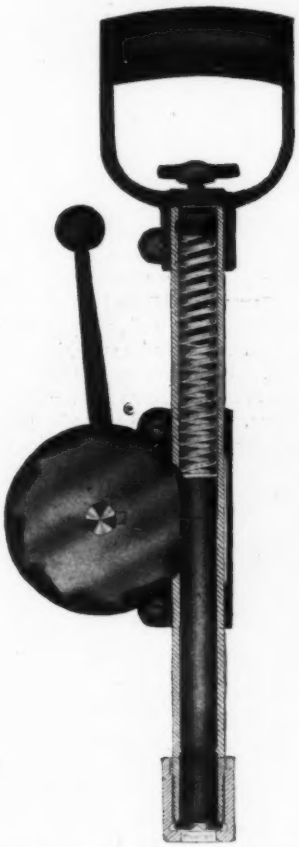
Electric Railway for Saskatoon.

The city of Saskatoon, Canada, has arranged with the Stone & Webster Engineering Corporation of Boston for the construction of a new street-railway system.

The contract includes the building of twelve miles of single track throughout the city, the installation of two 300-kilowatt motor-generator sets, together with necessary switchboard apparatus, etc., in the present power station, and the design and construction of a brick and timber car barn capable of housing about 18 single-truck cars.

The Phillips Spring Hammer.

The Daugherty-Smith-Phillips Company, 500 West Division Street, Chicago, Ill., has placed on the market the Phillips spring hammer. This hammer is an especially valuable tool for electricians, millwrights, power-station construction men, plumbers, stone masons, sign hangers, and those engaged in similar work. For electricians working on sign-hanging jobs, and for installation work in power houses, new or old buildings, telephone exchanges, and outside telephone construction work this spring hammer meets a long-felt want. In many jobs it is impossible to use a mechanical hammer owing to the difficulty of getting the proper auxiliary accessories. The Phillips spring hammer is self-contained in every detail, and the mechanic finds it of the greatest service over a great range of work.



Sectional View of Phillips Spring Hammer.

The accompanying illustration gives a fair idea of the construction of the tool. The drill action is effected through the medium of a plunger sliding in a cylinder. The upper portion of the plunger is slotted and the ratchet in the end of the slot forces the plunger against the spring. The plunger and spring are always under pressure, and the drill receives the full thrust or blow from the tension of the powerful spring. The tension of the latter may be regulated to alter the force of the blow through the medium of a thumb-screw in the handle of the tool.

The tool strikes from 800 to 1,200 blows per minute, and it is claimed that it will actually save from 50 to 90 per cent over the old method of drilling by hand. The tool will deliver ten blows at a less expenditure of energy than will be expended in one blow from the swing of a two-pound hammer. The tool automatically delivers a series of hard, fast blows, and as soon as the mechanic is used to the operation of the tool he can perform a great variety of work and continue at it with little exertion.

For overhead work there is an extension made of three lengths of steel tubing, telescopic, with clamp rings and screws. When extended and connected to the hammer this will reach an 11-foot ceiling. The extensions are made of standard pipe size at the bottom to permit of lengthening. It is equipped with a cast-iron saddle and steel bolt for connecting to the handle of the hammer, and a lever for turning the hammer and drill. A 16-inch coil spring holds the hammer against the work relieving the operator of all strain. This extension is easily and quickly adjusted.

Drills for Spring Hammer.

The special drills furnished for this tool are illustrated herewith. The "star" and "hollow" drills are forged from high-grade tool steel, and are furnished with extra long flutes which permit of redressing the tool many times. The three-inch flute and the small stem affords a free passage for cuttings, preventing the drill from choking or hanging in the hole. The leverage for turning the drill and the blow for every position of the cutting edge assure a perfectly round and straight hole, true in size from start to finish.

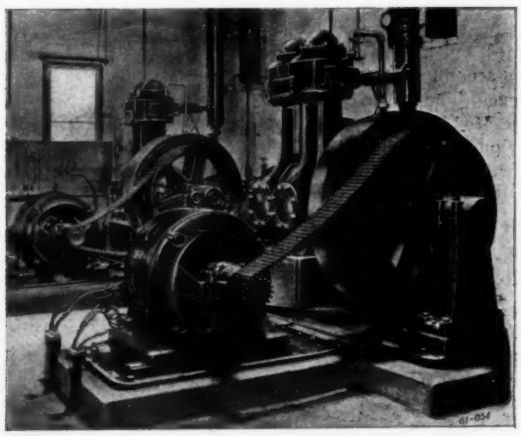
While the "star" drill is particularly effective in heavy, tough drilling, the "hollow" drill is recommended for brick or for places where the hole is being drilled in mortar joints, as it makes a round, clean hole either in the joints or the body of the brick.

The hammer is light enough to form a part of every electrician's kit, and can be handled with great facility both inside and outside the station for power construction work. The drills are furnished from one-quarter to one and one-quarter inches in diameter, up to 24 inches in length for the hollow drill. Special drills of larger dimensions may be made and used if the work requires these extraordinary dimensions.

Motor-Driven Refrigerating Plant.

The subject of artificial refrigeration has become an exact science. We no longer have to depend upon guesswork or make experiments in the installation of an efficient and durable cooling or ice-making plant.

The work of the refrigerating engineer is considerably lessened by the fact that he has at hand so able a source of power as the electric motor. Refrigerating machinery needs attention and maintenance and the less time the man in charge has to devote to the driving equipment the better the condition in which he can keep the cooling devices.



Motor-Driven Refrigerating Plant.

It must be remembered that cooling plants usually run 24 hours a day and that failure may involve the loss of considerable money through the spoilage of perishable goods. The question of greatest importance, therefore, is continuity of operation and this phase of the subject overshadows even the efficiency of the complete system. The drive must therefore be simple and rugged and all points of possible derangement or failure must be eliminated.

The illustration shown herewith represents part of the refrigerating equipment at the Emil Sieloff refrigerating plant, butcher shop and packing house in St. Louis, Mo.

The equipment shown consists of two eleven-ton York double-cylinder, vertical single-acting, inclosed machines with safety head, running at 140 revolutions per minute. Each machine is run by a 25-horsepower Wagner 220-volt, 850 revolutions per minute, three-phase, motor with wound-rotor. The motors are mounted on a base extended from the machines and are connected to them by means of silent-chain drives.

The brine system of refrigeration is used, the cooling being done in double-pipe brine coolers, which are submerged in a brine tank. The brine is circulated through the coils in the rooms and compartments of the packing house and butcher shop by a 100-gallon-per-minute, two-stage Lewis centrifugal brine pump. Another Wagner motor, of 5 horsepower, is used to operate this pump.

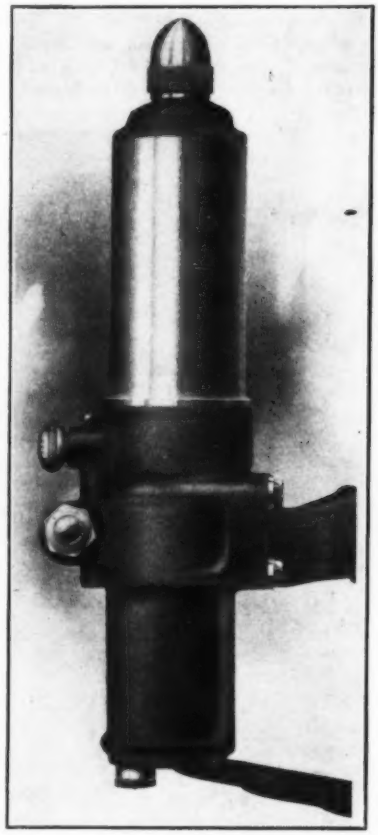
The plant is designed for 12 hours' operation of the machines when operating a maximum capacity. At other times only one machine is operated, the second machine being kept in reserve. The centrifugal brine pump is operated continuously during the period when the machines are shut down, circulating the cold brine stored in the tank through the pipe line into the various compartments.

The Westinghouse Automobile Air Spring.

A very important development in the automobile industry is the invention and perfection of an automobile air spring that is destined to bring far-reaching benefits to the owners and users of all kinds of electric or gasoline pleasure and commercial cars. The object of the inventor was to make possible thoroughly comfortable and fast riding over the roughest pavements and roads and at the same time to reduce to a minimum the shock and wear on the car resulting from such fast riding. That these objects have been achieved as actual results goes without saying when it is known that the inventor of the new air spring is no less than George Westinghouse, famous as inventor and perfecter of the air brake and countless mechanical and electrical machinery and devices. Over three years have been spent in the development of the automobile air spring, Mr. Westinghouse being characteristically unwilling to place it on the market until it had been perfected into a thoroughly practical and reliable device.

Hitherto there has been but little improvement in the spring suspension of automobiles, despite their increased speed and weight. It is true that many so-called shock absorbers have been developed and these served to reduce the violence of the most severe jolts, but always at the expense of the resiliency of the mounting. The Westinghouse air spring is not a shock absorber in this sense. It is a shockless spring with a very high degree of elasticity and accurate adjustability to its load. It prevents not only the catapultic action that throws a person violently from his seat when the car suddenly strikes a bad rut or obstruction, but it makes possible unslackened riding over cobblestone or other rough pavements with as much comfort as one experiences in a Pullman railroad car.

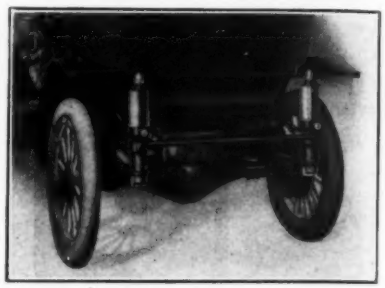
The Westinghouse air spring is a vertical telescoping cylindrical air chamber that replaces the customary rigid connections between the body of the car and one end of each of the four steel springs usually employed. It thus supports the



Westinghouse Automobile Air Spring.

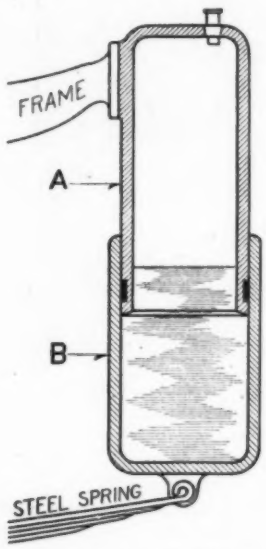
car body on four cushions of compressed air. It has a movement for expansion and compression of six inches. Although it is possible to dispense with the steel springs entirely, it has been found desirable to mount the air spring on the end of the semi-elliptic steel spring, thus making a much simpler and more flexible connection. By means of strong special brackets the air springs can be applied to any make of car.

Two of the accompanying illustrations show the general appearance of the Westinghouse air spring and the manner in which it is applied to a car. The principle of the spring is shown by the simple diagram herewith. If two cylinders *A* and *B* are arranged for telescopic movement within each other, one being connected to the frame or body of the car and the other to the spring and axles, and if the lower cylinder contains oil and the upper one compressed air, it is evident that this capsule arrangement will form an elastic cushion or air spring. With an initial air pressure, the spring



Application of Air Springs at Rear of Car.

will support a certain load before it begins to telescope or compress; by increasing or decreasing the amount of oil the air pressure is increased or decreased and consequently the resistance of the device to compression, or its scale, is readily adjusted. However, a simple telescopic joint, such as shown in the theoretical diagram, can not be made practically proof against leakage of air or oil;

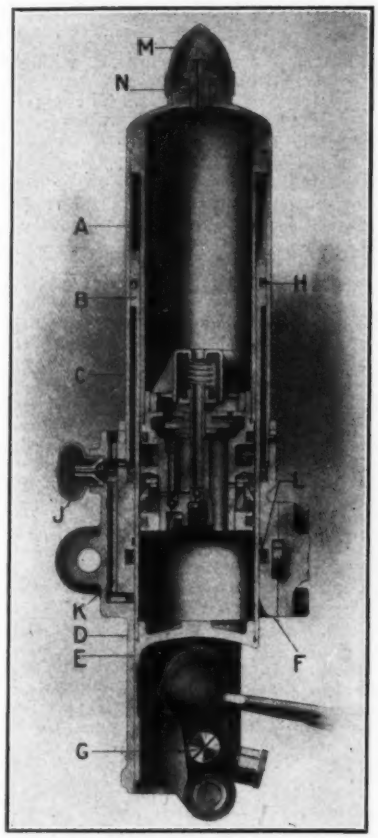


Theoretical Principle of Air Spring.

therefore the actual construction involves a somewhat more elaborate design, as shown in cross-sectional view.

The upper cushioning chamber is a double-walled cylinder *A*, between the walls of which the lower cylinder *B* can be telescoped. The outer casing *C* of the upper cylinder acts as a guard to keep out mud and dust from the telescopic joint between the chambers *A* and *B*.

To the lower end of *C* is secured a steel casting *D*, which serves as a guide for the lower part of *B* and for its end piece *E*. On *D* is a rectangular frame *F* which is bolted to the bracket on the frame of the car. On the bottom of the device is a link *G*, whose upper end is secured to the steel spring of the car. *H* is a packing ring between the widened upper end of *B* and the casing *C*. As the chambers *A* and *B* telescope with the compression of the spring, the narrow annular air space between *B* and *C* increases in length and air is then drawn into this space through the "breather" *J* or air-inlet valve shown at the left. In this is filtering material to prevent the introduction of dust. When the spring extends and *A* and *B* tend to separate, the



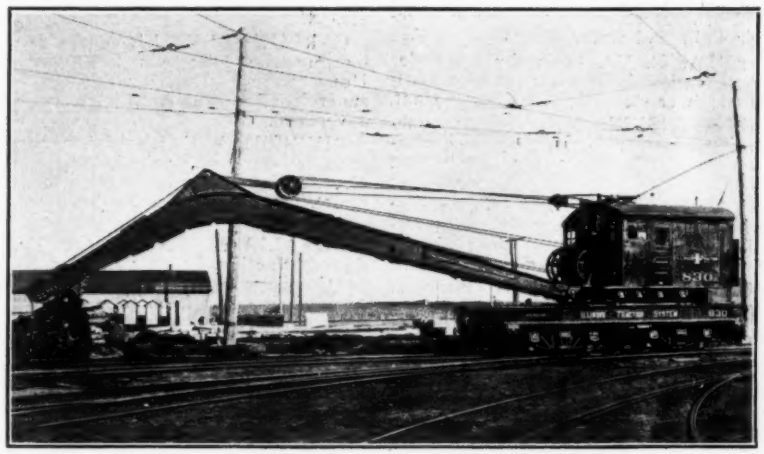
Sectional View of Actual Design.

air in the annular air space is driven out through the passage *K* into a port partly surrounding *B*, thus blowing out through the open joint between *B* and the guide *D* and preventing the entrance of dirt and dust. A felt wiper *L* also serves to keep out dust and prevent the leakage of lubricating oil from the ring just above it. On top of the device is an air valve *N* tightly covered by a screw cap *M*.

Secured within the lower end of chamber *A* is the mechanism that constitutes the real essence of the invention. It includes three packing rings to prevent the leakage of oil and air from the joint between the two cylinders *A* and *B*, lubricating devices for this joint, and a single-acting pump and regulator in the center that equalizes and steadies the action of the spring. The air spring is normally filled with oil to a height just covering the central mechanism. The oil used is an excellent lubricant and does not freeze or harden at low temperature.

The Westinghouse air spring has been subjected to the most severe and critical tests during its period of development. For over three years it has been tried out on cars weighing from 1,000 to 5,600 pounds; one car equipped with it last year covered over 10,000 miles and thoroughly proved the advantages of the air spring. Besides the advantages already mentioned these include: it increases the durability of pneumatic tires; it permits higher speed and gives greater serviceability to electric and other cars equipped with solid cushion tires; it reduces the wear and tear on the car; it is handsome in appearance and harmonizes with the general lines of the car.

The Westinghouse automobile air springs are manufactured for Mr. Westinghouse, who owns the exclusive rights, by the United States Rapid-Fire Gun & Power Company, Derby, Conn. The Westinghouse Air Spring Company, 23 West Sixty-second Street, New York City, is placing them on the market.



Electric Wrecking and Construction Crane.

An Economical Railway Crane.

The many advantages and economies obtained by the use of electric motors as compared with steam engines for operating railway cranes are daily becoming better known. Many orders for electric cranes have resulted, especially for the manufacturers that have from the first used the most reliable material and parts.

An electric crane is always ready for duty, an essential of any serviceable crane; there is no time wasted in getting up steam, which is often a serious handicap for steam cranes. Another advantage of the electric crane is that power is consumed only when actually being used.

The illustration shows a typical high-grade electric crane owned by the Illinois Traction System and used for wrecking purposes on its Danville and Urbana Division. This crane, which was furnished by the Browning Engineering Company, is equipped with a 30-foot goose-neck boom, with a main and an auxiliary hoist. The main hoist has a radius of 25 feet, and the auxiliary hoist a radius of 30 feet. The maximum lifting capacity of the main hoist is 30 tons at 12-foot radius, and 11.5 tons at 25-foot radius. The hook speed of the auxiliary hoist is 200 feet per minute while that of the main hoist is 50 feet. The working weight of this crane is 65 tons. Its height is 13.5 feet; width, 9 feet 10 inches, and length 24 feet.

The motors are of the Westinghouse No. 303 direct-current, commutating-pole railway type. The control is designed so that the crane is handled by one man. Power is taken from wires overhead and lead to the controllers through a collector ring on the rotating base, and a shoe on the stationary base. All wiring is inclosed in metal and fiber conduit so as to be protected from moisture and mechanical injury. The crane is self-propelling at the rate of 600 feet per minute.

Phonographic Music Transmitted by Telephone.

The New York Magnaphone & Music Company has inaugurated the central-station generation and distribution of music, thus carrying out a scheme proposed by Edward Bellamy in his book "Looking Backward," published in 1887. The music in this case, however, is produced by motor-driven phonographs operated at the Music Exchange, Broadway and West 111th Street. Each instrument operates in connection with 100 telephone transmitters.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

CARRINGTON, N. D.—The Council will probably provide for electric lighting. C.

COTULLA, TEX.—The Cotulla Power & Ice Company will establish an electric light plant here. D.

DARBY, MONT.—The Commercial Club is working to secure the establishment of an electric light plant. C.

HUNTINGTON BEACH, CAL.—Specifications are being prepared for an ornamental lighting system.

MT. VERNON, KY.—A new electric light and power plant is to be erected in this city in the near future. G.

EPWORTH, IOWA.—The Council will ask estimates of cost for an electric light and water works plant. C.

PULASKI, VA.—This city has under consideration the construction of a 1,500-horsepower steam-driven electric plant.

UNIVERSITY, MO.—Regents Publishing & Mercantile Company has a franchise to build electric, gas and heating plants.

VADE MECUM, N. C.—Cicero Tise will install a hydroelectric plant to furnish light and power for Vade Mecum Springs.

HASTINGS, IOWA.—A franchise has been voted for electric lighting, power to come from the plant at Glenwood, Iowa. C.

SANDWICH, ILL.—Sealed bids will be opened October 14 by the City Council for the sale of the municipal electric light plant. Z.

GLENDALE, CAL.—The city lighting system is to be extended to Verdugo Canyon, which was recently annexed to the city.

GLEN ULLIN, N. D.—A site has been purchased for the electric light plant. Work on the station building is to be started at once. C.

TEXHOMA, OKLA.—J. W. McRea, Amarillo, Tex., and associates will build light, water and ice plants here at an estimated cost of $40,000.

SPRINGVILLE, IOWA.—A franchise has been granted to the Wapsie Power & Light Company, to furnish electric lights and power. C.

ST. CLOUD, MINN.—The Public Service Company will build a power line through Waite Park, Rockville, Cold Springs and Richmond. C.

DEVILS LAKE, N. D.—The Western Utilities Company succeeds to the local light plant, and will erect a power station. F. E. Corson is manager. C.

ROCK ISLAND, ILL.—Property owners on Twentieth Street between Third and Fourth Avenues are planning to install ornamental lights. Z.

FORT WORTH, TEX.—Fort Worth Power & Light Company will extend its electrical transmission system to Niles City at an expenditure of about $4,000.

FORT DODGE, IOWA.—The Central Iowa Light & Power Company will erect a substation and make other improvements here to cost about $90,000. C.

YACOLT, WASH.—The Northern Clark County Light & Power Company has been incorporated with a capital stock of $15,000 by C. R. Miller and others.

LEXINGTON, KY.—The Kentucky Traction & Terminal Company is arranging to supply 24-hour current to Georgetown, from its central station in this city. G.

ARLINGTON, S. D.—Steps will be taken at once to install a municipal electric lighting system in this place. The cost of this undertaking is estimated at $10,000.

CARLINVILLE, ILL.—No bids for lighting the Macoupin County Alms House were received by the board of supervisors and the contract will be readvertised. Z.

RIVERSIDE, CAL.—Eighth Street is to be improved by the installation of electric lights on both sides of the street, extending from Market to Pepper Street.

PUYALLUP, WASH.—The Puget Sound Traction, Electric Light & Power Company will run a high-tension transmission line from the Snoqualmie plant to Puyallup.

RIVERSIDE, CAL.—As no bids were received for the installation of an ornamental lighting system, the city officials figured on the job themselves, and took the contract.

INDIANAPOLIS, IND.—Fire destroyed the Big Four power house here the loss amounting to more than $10,000. The dynamos are not seriously injured and the plant will be rebuilt at once. S.

NEWPORT, ARK.—The Co-Operative Electric Company has been granted a franchise for 20 years to operate in this city providing the company completes the installation of its plant within six months.

COLUMBIA, S. C.—Carolina Public Service Company has been incorporated with a capital stock of $2,000,000, to buy and build electric and other public utility plants. The company will establish Columbia offices with C. S. Campbell in charge.

GREENCASTLE, IND.—The Putnam Electric Company has been awarded a new 20-year franchise by the City Council and contract for lighting the city. The new franchise goes into effect July 1, 1913. S.

FREDERICKSBURG, Tex.—Messrs. Netwig and Beckman have purchased the local electric light plant. The new owners will install additional machinery and make other improvements to the property. D.

ARTESIA, N. M.—The Pecos Valley Gas & Electric Company has taken over the holdings of the Artesia Light & Power Company here and is preparing to install new engines and other equipment in the plant. D.

ROANOKE, VA.—Roanoke Utilities Corporation has been incorporated with a capital stock of $25,000, with E. M. Funkhouser, president; J. B. Fishburne and James P. Woods, vice-presidents; and H. C. Elliott, secretary.

TAMPICO, ILL. — The Village Board has closed a contract with the Illinois Northern Utilities Company to light the village streets. The present lamps will be replaced with 50-watt, 40-candle power tungstens. Z.

ROGERS, TEX.—G. L. Jones, of Temple, will install an electric light and power system here. The current will be brought from the plant of the Temple Power & Light Company, Temple, a distance of 14 miles. D.

DULUTH, MINN.—It has been announced that the Duluth Street Railway Company will build a $40,000 substation in this city to provide for a more economical and even distribution of power and possible future extensions.

FULTON, N. Y.—The American Woolen Mills' Company will, it is stated, build a new and modern power plant, during the installation of which the Fulton Light, Heat & Power Company will supply power and electricity to run the plant.

HEDRICKS, IOWA.—The Council is considering propositions for electric lighting. The Sigourney Transmission Company offers to extend its transmission line from Sigourney without requiring a bonus or stock subscription.

JACKSONVILLE, FLA.—A plan for an ornamental system of street lighting has been adopted by the city whereby it is proposed to do away with the present arc-light system and install incandescent lamps on ornamental posts of uniform design.

ELYRIA, O.—It is reported that there is a movement on foot among the citizens of this place to have a municipal electric lighting plant, and Henry Andress has offered to donate $1,000 to see the proposed plant become a reality.

LAURENS, IOWA.—The Northern Power Company of Humboldt, Iowa, will install a local electric light system and will extend a power transmission line here from Rolfe. The local system will include street lights, electroliers, etc. C.

WEST, TEX.—The Texas Power Company, which is an allied interest of the Southern Traction Company, which is constructing the Dallas-Waco interurban railroad, has been granted a franchise to construct a power and light plant in the corporate limits of this city.

CLEAR LAKE, IDAHO.—Articles of incorporation have been filed by

the Clear Lake Power & Improvement Company, with a capital stock of $750,000. The directors of the company are William C. Hazzard, Norman J. Kopemier, R. T. Hazzard and William J. Kopemier.

MENTONE, IND.—The Mentone Water & Light Company has filed articles of incorporation with the Secretary of State. The object is to construct and operate plants for furnishing water and light. C. W. Shaffer, M. O. Metzger and M. F. Clark are the incorporators. S.

GOSHEN, IND.—Chapman & Company, consulting engineers, Chicago, have reported that it will require an expenditure of $83,500 to put the city lighting plant in first-class condition. The councilmen favor the installation of a new and modern plant, which they assert would cost no more. S.

CHATTAROY, WASH.—William Zinter and Frank Spinning have purchased the electric lighting plant located about four miles up the river from this place. The new owners have commenced improvements on the property and it is expected that about $3,000 will be spent renovating the plant. Five miles of new wire will be put up.

NEW KNOXVILLE, O.—A company of citizens of this place, with B. J. Cook as president and Edward C. Holl, manager, has been organized with $8,000 capital stock for the purpose of furnishing the village with electric light, heat and power, using current from the Western Ohio traction power house. It is stated that work on the new plant will commence at once.

MOORESVILLE, IND.—With a capital stock of $75,000 the Mooresville Public Utilities Company has been incorporated by the Secretary of State. This company proposes to acquire, extend and maintain a plant to furnish Mooresville with electric light, power, water, heat, and other utilities. The incorporators are Edward E. Gates, James A. Ross and John S. Powell.

VINCENNES, IND.—It is reported that the City Council has granted a franchise to the Vincennes Traction Company to furnish electric current within a given territory at a rate of six cents per kilowatt for residents and four cents per kilowatt for manufacturers. Said franchises to become null and void if work is not commenced within six months. S. S. Bush of Louisville is superintendent

YOAKUM, TEX.—Messrs. Green and Welhausen will construct a dam across the Guadalupe River, about 12 miles from Yoakum, for the purpose of storing water to operate a hydroelectric plant. From this plant power transmission lines will be constructed to Yoakum and other towns of this section, and it is also contemplated to provide this town with a system of electric lights. D.

WAYNE, N. Y.—A certificate of incorporation has been granted to the Wayne Power Company, which is chartered for the purpose of manufacturing and distributing electric current for light, heat and power in Avoca and Cohocton. The capital stock of the company is $10,000, and the principal offices will be at Sodus. The directors for the first year are Charles W. Mills, Willard H. Richardson and George R. Mills, of Sodus.

WEST SPRINGFIELD, MASS.—Authorities of this place have received a petition from the Warren Mills & Power Company asking permission to erect four poles and install wires thereon in that town. The request is made as a preliminary to seeking a franchise to supply electricity in the town. It is stated in this connection that the Amherst Power Company has also entered into negotiations with the Selectmen of West Springfield looking toward obtaining similar rights.

PARIS, ILL.—The Edgar County Board of Supervisors has granted a franchise to the Georgetown Electric Company, which is connected with the Illinois Traction System, to build pole and wire lines in the townships of Ross, Prairie, Brouillettes Creek, Edgar, Young America, and Embarrass. The company already has a contract for the street lighting at Chrisman, and to supply power to the Rayfield Automobile plant at Chrisman, and proposes to supply power to farm houses.

CORDELE, GA.—The City Council has under advisement the construction and operation of a municipally owned electric lighting system in connection with the water works system already in use. Cordele voted bonds to the amount of $95,000 for public improvements last June. These bonds have been regularly advertised and bids have been filed, but have been rejected by the aldermanic body, on the grounds that the premiums offered were not sufficiently large.

MIAMI, ARIZ.—Irving C. Harris, of the United States Reclamation Service, is in charge of the construction of an electric power transmission line which is to run from the hydroelectric plant at the Roosevelt dam to the mines of the Inspiration Copper Company and the Miami Copper Company at Miami. This line will be 35 miles long and will supply 11,000 Kilowatts. The cost of the line will be more than $500,000. The transmission wires will be strung on steel towers set in cement bases. D.

DURHAM, N. C.—The Durham Power Company has been chartered with an authorized capital stock of $750,000. The incorporators are B. N. Duke, George L. Lyon and Jones Fuller. This company has been formed to enter the local field as a general public service corporation, and will at once begin the construction of a power and light system and make bid for lighting and furnishing power for both public and private uses. Already a car load of poles has arrived to be used in putting in the light system, and other cars are in transit. The company will also operate an ice factory and later on will probably enter the street railway business.

IOWA FALLS, IOWA.—The Iowa River Light & Power Company has filed articles of incorporation with a capital stock of $3,000,000. This company will develop the waterpower along the Iowa River for the purpose of furnishing electrical energy for lighting and power purposes to a number of cities and towns in this part of the state. It is stated that Eldora parties are back of the enterprise, which is practically a reorganization of the Park Dam Company, which was formed at Eldora a year ago and which developed the waterpower in the river at that point. This company recently took over the steam-electric light plant at Eldora and will use it as a steam auxiliary in connection with the power plants at Eldora and Steamboat Rock.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

PEMBINA, N. D.—The Pembina Rural Telephone Company will build at once to Carlisle. C.

GERING, NEB.—The Platte Valley Telephone Company will erect an exchange building here. C.

SCOTLAND NECK, N. C.—Carolina Telephone & Telegraph Company will improve its exchange at this place.

INTERNATIONAL FALLS, MINN.—The International Telephone Company will build a line to Blackduck at once. C.

CONNELLSVILLE, PA.—The Bell Telephone Company has been granted a permanent franchise in South Connellsville.

DOUGLAS, ARIZ.—The telephone system of this city is to be entirely reorganized. The company plans to use underground conduits to carry the wires.

HOLLAND, VA.—Holland Telephone Corporation has been incorporated with a capital stock of $5,000. I. A. Luke is president and L. J. Daugherty, secretary.

PRESTONSBURG, KY.—The Prestonsbury & Hindman Telephone Company has increased its capital stock $12,000 and added telegraph lines to its corporation powers.

CHERRYFIELD, N. C.—Cherryfield-Rosman Telephone Company has been incorporated with a capital stock of $10,000 by J. C. Whitmere, L. M. Hamilton, C. E. Lyday and others.

RUSHVILLE, ILL.—The Schuyler Telephone Company has been incorporated with a capital stock of $10,000. The incorporators are Enoch Edmonson, H. B. Anderson, D. F. Haber and C. L. DeWitt.

MILDRED, MONT.—The Mildred Telephone Company has been incorporated with a capital stock of $5,000 by S. A. Souther, of Mildred, and F. C. Collins, of Chicago, and G. C. Burge, of Wilmette, Ill.

ROSS, N. D.—The Ross Telephone Company has been incorporated with a capital stock of $25,000. The incorporators are George McShane, J. E. Smith, R. H. McEnany, A. H. Gleason and David McKinnon, all of Ross.

SAN FRANCISCO, CAL. — The Marconi Wireless Telegraph Company of America is figuring on a site near Bolinas for a wireless station. It is the intention of the company to expend about $150,000 on the plant.

RUSVILLE, ILL.—The Schuyler Telephone Company has been incorporated with a capital stock of $10,000 to operate a telephone system. The incorporators are Enoch Edmondston, H. B. Anderson, D. F. Haber and C. L. De Witt. Z.

SPRINGFIELD, LA.—Livingston Telephone Company has been organized with J. M. Ehlert president and W. J. Settoon secretary-treasurer. The company will construct a telephone system in the Livingston parish and an extension to Ponchatoula, La., where connection will be made with the Cumberland Telephone & Telegraph Company.

VASSAR, MICH.—At a recent meeting of the Board of Trade of this place it was decided to take steps to organize an independent telephone company and it is stated that this project is meeting

with the hearty co-operation of the citizens.

INDIANAPOLIS, IND.—Articles of incorporation of the Greenleaf Bridge Mutual Telephone Company have been filed with the Secretary of State. The capital stock is $150 and the directors are P. H. Fischer, M. B. Spurgeon and H. H. Spieth.

MUSKEGON, MICH.—The State Railroad Commission has granted permission to consolidate to the United Home Telephone Company, of Ludington, and the Citizens' Company, of Muskegon, with an increase in capital stock of $200,000, which it is expected will allow for the rehabilitation of the present telephone system in this place.

BROOKLYN, N. Y.—Telephone extensions costing $1,500,000 will, it is understood, be made in Brooklyn this year, which will include many improvements to the telephone plant. The telephone growth in Brooklyn is increasing at such a rate that this expenditure is being made to provide ample facilities for future telephone subscribers and to insure the best possible telephone service for this city.

SAN ANTONIO, TEX.—It is authoritatively announced that the Southwestern Telegraph & Telephone Company, which is a subsidiary of the American Telegraph & Telephone Company, has about closed negotiations for the purchase of the holdings of the Eureka Telephone Company which has its headquarters in San Antonio. The latter company operates more than 1,000 miles of long distance lines in South and Southwest Texas. The lines of the company will be connected with those of the Southwestern system and will be extended to other towns in the territory in which the system now operates. D.

ELECTRIC RAILWAYS.

(Special Correspondence.)

WILSON, PA.—A charter has been issued to the Pine Run Railway Company. The capital stock is $8,400.

SAN DIEGO, CAL.—The San Diego Electric Railway Company has been granted a 40-year street-railway franchise in this city.

MARTINEZ, CAL.—The Oakland & Antioch Railway Company has been granted a right of way for several miles through the Rancho Los Medanos.

ATLANTIC CITY, N. J.—The Bungalow Park Trolley Company is being formed for the purpose of building an electric street car line in this city which will cost about $40,000.

MINNEAPOLIS, MINN. — The Electric Short Line is considering routes west of Lake Minnetonka, through Litchfield and also through Winsted, Silver Lake and Hutchinson.

SOUTHAMPTON, MASS.—The citizens of this place are working for the extension of an electric railway through their town and have placed the matter in the hands of the State Railroad Commission. W.

LEBANON, PA.—The Ephrata & Lebanon electric railway is finally to be completed by decree of the stock-holders who have decided to use storage battery cars. The cost of the new work is estimated at $250,000.00. N.

SHREVEPORT, LA.—The Shreveport Traction Company has purchased a franchise to operate and build an electric railway line between the city limits and the Cedar Grove factory addition, south of the city.

MINNEAPOLIS, MINN.—The City Council has ordered the street car company to extend the Oak and Harriet car line to the St. Paul city limits and to build a new car line on Franklin Avenue from Fourth Street to the river. C.

ARKANSAS CITY, ARK.—The Interstate Interurban Company, which has been acquiring right of way between this city and Ponca City, will be chartered under the laws of Oklahoma, with a capital stock of $500,000. The line will be 50 miles long.

BROWNWOOD, TEX. — The Brownwood North & South Railway Company has decided to issue a bond issue in the amount of $60,000 for the purpose of extending the line from its present terminus to some point on the Texas & Pacific railroad.

ARKANSAS CITY, KANS.—It is stated that the Arkansas City Electric Railway Company will extend its line south to the towns of Chilocco, Newkirk, Kildare, Blackwell, Ponca City and Tonkawa, Okla. This extension will be 50 miles in length.

CORPUS CHRISTI, TEX.—It is reported that Newberger, Henderson & Loeb of Philadelphia are negotiating for the purchase of the electric street railway system of the Corpus Christi Traction Company, and that if the deal is made the system will be extended and improved. D.

HUNTSVILLE, UTAH.—A franchise has been granted to the Ogden Rapid Transit Company to build and operate an electric car line from the Hermitage to Huntsville, in Ogden Canyon. The franchise provides that construction work must commence within six months.

HOUSTON, TEX.—The Commissioners' Court of Harris County has granted a franchise to the Houston Electric Company, authorizing the construction of an electric street railway over Fifteenth Street and Navigation Boulevard in Central Park and Avenue M in Magnolia Park. D.

THORNTOWN, IND.—The Lebanon & Thorntown Traction Company has anonunced a plan to install a rural auto-traction line between Thorntown, Colfax and Clark's Hill in the near future. These buses will make connections with the traction cars on the Lebanon and Thorntown line.

OTTAWA, ONT.—The Ottawa & St. Lawrence Electric Railway Company, which has a capitalization of $4,000,000, has started work on its road to Morrisburg. This is just the first of several interurban lines which will be built by the company. It is stated that J. A. Morden & Company of Toronto are financing the project.

FORT WAYNE, IND.—It is understood that there is a movement on foot to build an interurban line from Angola to Hamilton and on to Waterloo, thus making a direct traction route to the Northern lakes. It is also reported that the same project includes the purchases of a string of power houses to furnish power for the new line.

SALT LAKE CITY, UTAH.—It is reported that A. J. Orem & Company, of both Salt Lake City and Boston, Mass., has arranged with the Utah Interurban Company to finance the building of the road from this city to Payson, and to purchase all the equipment, a total of approximately $2,000,000.

EAST ST. LOUIS, ILL.—The St. Louis, Chester & Thebes Railway Company has been incorporated with a capital stock of $100,000, to operate a railroad from East St. Louis to Thebes. The incorporators and first board of directors are C. F. Stephens, A. B. Corwin, A. L. Bowne, St. Louis, Mo.; D. H. Donavan, W. J. Lewis, J. N. Sparling, G. W. Holley, Charles L. Rorabaugh and J. H. Hohl, all of East St. Louis. Z.

DALLAS, TEX.—The Trinity Valley Company has its preliminary plans for the construction of an interurban electric railway between Dallas and Austin so well advanced that the survey for the proposed line will soon be started, according to the announcement of the promoters of the project. It is stated that the line will be about 235 miles long by the route that is to be followed. Among the towns that it will pass through are Hubbard, Marlin, Temple and Georgetown. D.

HILLSBORO, TEX.—It is authoritatively stated here that the Stone & Webster Engineering Corporation of Boston, Mass., which recently finished the construction of an interurban electric railway from Dallas to Cleburne, will extend the road to Hillsboro, about 35 miles. The route is via Alvarado. As soon as the right of way can be secured and other preliminary details arranged the work of construction will be started. It is planned to have the extension finished in 18 months.

INDIANAPOLIS, IND.—Articles of incorporation have been filed by the Interstate Public Service Company, capitalized at $3,000,000, with headquarters in this city. The object is to promote, finance, construct, equip, rent and operate in Indiana and elsewhere street and interurban railroads and plants for the manufacture and distribution of electricity for light, heat and power. The directors are M. E. Thornton, J. F. Doyle, L. O. Keikes, L. C. Joyer, Arthur K. Zachary and Albert E. Chapman, all of Chicago. S.

CEDAR RAPIDS, IOWA.—The Iowa Public Service Corporation has been organized at this place with a capital stock of $6,000,000 for the purpose of taking over a number of interurban railways and electric light and power plants in this state. The property of the new corporation, of which the Dows interests at Cedar Rapids will have control, comprises the interurban railway from Cedar Rapids to Iowa City, the one now in course of grading from Cedar Rapids to Mount Vernon, the line between Tama and Toledo, and the electric plants at Cedar Rapids, Marion, Tama and Toledo, Boone, Perry and Marshalltown.

SPRINGFIELD, ILL.—The Springfield, Clear Lake & Southern Railway Company has been incorporated with a capital stock of $2,500, to take over the Springfield, Clear Lake & Rochester Interurban Railway. It is planned to secure the property by foreclosure to improve the road and build a branch line to Riverton. Traffic on the line between Springfield and Rochester and Springfield and Clear Lake has been suspended until repairs of bridges ordered by the State Railway and Warehouse Commission have been made. The principal office will be in Springfield. The incorporators are N. R. Gordon, A. W. Sikking, W. R. Thompson and H. L. Metcalf, of this City,

and W. G. Brown, of Rochester.

DEAL ISLAND, MD.—Construction work by the Eastern Shore Power, Light & Railway Company, of Maryland, which was chartered at the last session of the legislature to build a line along the eastern shore of Chesapeake Bay, will be begun shortly. It is proposed to run this line from Deal Island to Snow Hill, a distance of 43 miles. The right of way has been secured, and the road will be pushed to completion as rapidly as possible. Track laying is expected to commence on the first of the year. It is announced by the projectors of the enterprise that the financing has been successfully accomplished and that European capitalists have been interested. One of the novel features of the new line will be the construction of a siding every half mile so that the farmers will be given convenient facilities for shipping their produce. The line will pass through 150,000 acres of the best truck farming land in the country.

PROPOSALS.

ELECTRIC LIGHTING.—Sealed proposals, in triplicate, indorsed "Proposals for Remodeling Hospital" will be received by the Constructing Quartermaster, Fort Sill, Okla., until October 3 for the electric lighting for the hospital at this place. Information furnished upon application.

ELECTRICAL SUPPLIES.—Sealed proposals will be received by the Navy Department, Bureau of Supplies and Accounts, Washington, D. C., until October 15, for supplying 2,500 feet of silk triple conductor at the Navy Yard, Brooklyn, N. Y., as per Schedule 4852.

LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until September 23 for furnishing and installing the lighting fixtures in the post office at Wellington, Kans., and the post office and court house at Salt Lake City, Utah. Drawings and specifications may be obtained from the office of the supervising Architect.

LAMP STANDARDS AND BRACKETS.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until October 7, for furnishing lamp standards and brackets that may be required for various buildings under control of the Treasury Department, in accordance with drawings and specifications, copies of which may be had from the Supervising Architect.

WIRING AND LIGHT FIXTURES.—Sealed proposals indorsed "Proposals for Electric Lighting System" will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until October 5 for electric wiring and fixtures in the new general foundry building at the Navy Yard, Puget Sound, Wash., the estimated cost of which is $2,000. Plans and specification may be obtained upon application to the Bureau or to the Commandant of the Navy Yard named.

ELECTRIC CONDUIT WIRING AND INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until October 21, for furnishing electric conduit and wiring and interior lighting fixtures for a two-story-and-basement building for the post office at Moorhead, Minn., until October 22 for the buildings of the United States quarantine station, San Juan, P. R., until October 29, of a one-story-and-basement building for the post office at Elberton, Ga. Drawings and specifications may be had from the office of the Supervising Architect.

NEW INCORPORATIONS.

NEW YORK, N. Y.—National Marine Lamp Company has been incorporated with a capital stock of $60,000 by Frederick Persky, Jalmar Geruldsen and John Kleinberger, all of New York City.

NEW YORK, N. Y.—Telephone Herald Sales & Supply Company has been incorporated with a capital stock of $10,000 by John McLaren, E. J. Forhan and F. B. Knowlton, all of New York City.

NEW YORK, N. Y.—The Salvini Electrical Horn Manufacturing Company has been incorporated with a capital stock of $50,000. The incorporators are Edwin Salomon, Godfrey S. Salomon and Salvatore Salvini, all of New York City.

CHAUTAUQUA, ILL.—The Chautauqua Utilities Company has been incorporated with a capital stock of $3,000 to operate hotels, water works, electric plants and amusement enterprises. The incorporators are Nelson Levis, D. W. Caughlan, L. C. Haynes. Z.

PEEKSKILL, N. Y.—The firm of Lent & Burchetta Company, Incorporated with a capital stock of $5,000 to engage in a general electrical contracting business. The incorporators are John H. Lent, Frank A. Burchetta and Patrick Burchetta, all of Peekskill.

PITTSBURGH, PA.—The Commonwealth Electric & Supply Company has been incorporated with a capital stock of $200,000. The incorporators of the company are F. R. Fortune, J. R. Swift, D. E. Crane, L. Speidel, R. G. Dickson and C. L. Lobinger, all of this city.

NEW YORK, N. Y.—American Armature Company has been incorporated with a capital stock of $1,000 for the purpose of engaging in a general electrical business. The incorporators are Frederick B. Hose, Brooklyn, N. Y., Charles H. White and Charles G. Hose, New York City.

BROOKLYN, N. Y.—The Q.-C. Storage Battery Company, Incorporated, has been incorporated with a capital stock of $2,000 for the purpose of manufacturing storage batteries. The incorporators are Albert M. Friedenberg, Leopold Friedenberg, New York City, and Robert W. Vicarey, Brooklyn.

COLUMBUS, O.—The Southern Electric Equipment Company has been incorporated with a capital stock of $75,000 for the purpose of buying, selling, leasing, operating and equipping laundries with electrical supplies and machinery, and manufacturing such supplies and machinery. The incorporators are W. F. Felton and H. C. Mayers.

FARGO, N. D.—The Western Utilities Corporation is a new concern which has been formed for the purpose of taking over public utilities of the different cities and towns in the state and the capital stock has been fixed at $500,000. The company is backed by Fargo and Minneapolis capital and in time will have big holdings all over the state. Frank E. Corson is president of the new corporation.

FINANCIAL NOTES.

There has been no slackening in the steel or pig iron trade. The steel corporation's figures show an increase of 206,000 tons of unfilled orders during August. Evidence that the railroads will be big buyers of construction material next year is increasing. The most reassuring development in the supplemental report of the Government upon crop conditions, all forms of cereal and produce showing record-breaking yields.

Earnings of the Western Electric Company continue to run strikingly close to the forecast of the showing for this year made soon after the new year began. It was then figured that 1912 ought to yield a gross business of something like $67,000,000. Returns for the eight months ended with August give an indicated gross business for the year of approximately $68,000,000.

July was about 3 per cent ahead of the same month in 1911 and August was 3 per cent ahead of the corresponding month a year ago. The eight months of the current year are also about 3 per cent ahead of the same period last year. The most interesting feature of the company's business recently has been the tendency of the West to show greater activity.

About $750,000 will be spent in erecting new buildings at Hawthorne this year to take over the company's New York manufacturing business. The additions will be completed in about a year and are in line with the company's policy of concentration of the manufacturing branches at Chicago.

Export business during August and the last eight months has shown a relatively greater improvement than the domestic business.

The Morris County Traction Company of New Jersey, has issued $5,000,000 of new bonds. Of this issue, $3,000,000 are to be used to retire at or before maturity the same number of outstanding ones. The balance is to be used for extensions and improvements in the service.

A new bond issue has been made by the Hattiesburg (Miss.) Traction Company which has been underwritten by the City Bank & Trust Company, of Mobile. This issue amounts to $2,500,000 and the proceeds of the sale will be used to pay for extensions and improvements.

An order has been issued by the California Railroad Commission authorizing the Northern California Power Company to expend the full proceeds of its recent $500,000 note issue, which amounted to $480,000, as follows: $315,133 to reimburse the company for expenditures from income on construction of plant and $164,886 to pay obligations contracted for materials and labor in connection with improvement work. The notes were sold to Swiss bankers at ninety-six.

A mortgage has been filed by the Central Illinois Public Service Company, of Mattoon City, Ill., to the First Continental Trust & Savings Bank, of Chicago, to secure an issue of first and refunding bonds, of which $791,000 are reserved to retire underlying securities. The company filed a certificate July 29 increasing its capital stock from $330,000 to $6,000,000, of which $2,500,000 is preferred. The company is controlled by the same interests as the Middle West Utilities Company, an Insull concern which now owns quite

a number of small properties in Central Illinois and possesses options on many others.

Henry L. Doherty & Company, New York City, are organizing a new holding company, the stock of which will be offered to the public for subscription about October 1. It is understood that this new organization will be entirely a financing concern and will not be interested in operation. Details of the new organization are not yet available nor has it been made known what properties will be taken over, but it is understood that the stock issue will amount to at least ten million dollars, and that the six-per-cent preferred will be offered at par with a forty-per-cent bonus in common. By arrangements already made, $2,000,000 of this stock has been underwritten in the shape of short-time notes, which will be exchanged for stock. As all of the Doherty enterprises have proved to be profitable investments it is probable that this offering will be well subscribed when the offering is made. The magnitude of the undertakings of this firm has increased so rapidly that it has been found necessary to organize a more elastic medium of financing.

Announcement is made that J. P. Morgan & Company have purchased, subject to approval by the Railroad Commission of California, $5,000,000 general and refunding five-per-cent bonds of the Pacific Gas & Electric Company. They have sold the entire amount to N. W. Halsey & Company and Harris Forbes & Company, who expect to make a public offering of the same in the not-distant future. It is impossible to state at present at what price the issue will be offered to the public, but it is thought that it will be around 92½. This makes $25,000,000 of the company's general and refunding 5s that have been sold to J. P. Morgan & Company since the first of the current year, $20,000,000 having been taken in January last. The firm disposed of the $20,000,000 in the same manner that it will adopt with the $5,000,000 referred to above, just as soon as approval of the issue has been granted by the California Railroad Commission.

Dividends.

American Gas & Electric Company; the regular quarterly dividends of 1.75 per cent on the common stock, and 1.5 per cent on the preferred. The dividend on the common is payable October 1 to stock of record September 20. The dividend on the preferred is payable November 1 to stock of record October 17.

Canadian Westinghouse Company; a quarterly dividend of 1.75 per cent, payable October 10 to stock of record September 30.

Chicago City Railway Company; a quarterly dividend of 2.5 per cent, payable September 30 to stock of record September 13.

The Terre Haute, Indianapolis and Eastern Traction Company; quarterly dividend of $1.25 a share on the preferred stock, payable October 1. S.

Demerara Electric Company; a quarterly dividend of 1.25 per cent, payable October 1 to stock of record September 21.

Galveston-Houston Electric Company; a Common dividend of $2 per share, and a preferred dividend of $3 per share, both payable September 16.

Jacksonville Traction Company; a quarterly dividend of $1.50 on preferred stock and a quarterly dividend of $1.75 on the common stock, payable November 1 to stock of record October 15.

New York Edison Company; a quarterly dividend of 1.5 per cent.

Northern Ohio Traction & Light Company; a regular quarterly dividend of one per cent on the preferred stock, payable September 15 to stock of record August 31.

United Gas & Electric Company; a dividend on the preferred stock at the rate of six per cent covering the period from June 6, 1912, (the date of consolidation) to September 30, 1912, payable October 1 to stock of record September 12.

United Traction & Electric Company; a quarterly dividend of 1.25 per cent, payable October 1 to stock of record September 14.

United Utilities Company; regular quarterly dividend of 1.75 per cent on the preferred stock, payable Oct. 1 to stock of record September 21.

West End Street Railway; a common dividend of $1.75 per share, payable October 1 to stock of record September 21.

Western Union Telegraph Company; a quarterly dividend of 0.75 per cent, payable October 15 to stock of record September 20.

Reports of Earnings.

FEDERAL LIGHT & TRACTION.

	1912	1911
July gross	$133,836	$113,508
Net after taxes	49,296	37,264
Seven months gross	946,895	825,628
Net after taxes	385,490	329,427

EDISON COMPANY OF BOSTON.

Edison Company of Boston reports to the Massachusetts Gas Commission, for the year ended June 30, 1912:

	1912	1911
Gross	$5,787,345	$5,257,913
Net	2,666,595	2,461,110
Surp. after charges	2,405,252	2,271,117
Dividends	1,872,444	1,867,935
Surplus	532,808	404,082

Company has 43,246 customers, compared with 38,321 on June 30, 1911. In past fiscal year company sold 102,830,250 kilowatt hours of electricity against 88,402,608 previous year, and 75,684,057 two years ago.

QUEBEC RAILWAY & LIGHT.

The annual statement of the Quebec Railway, Light, Heat & Power Company shows gross earnings of $1,415,825, as against $1,280,127 in the previous year, and net earnings of $618,900, as compared with $618,220 in the previous year. The gross income amounted to $875,484, against $629,319 in the previous year. The net income amounted to $215,120, as against $172,990 last year. During the year the company paid out in dividends $199,990, and had left a surplus of $11,200. If dividends had not been paid in a portion of the year, the surplus for it would have amounted to $211,200, or equal to 2.11 per cent on the common stock.

NEW YORK RAILWAYS COMPANY.

President T. P. Shonts, of the New York Railways Company, has issued his report of operation for the six months ended June 30. The report details the circumstances of the incorporation last December of the company and the reorganization under which it came into possession of the property and franchises of the Metropolitan Street Railway system. Sections are devoted to capitalization, amortization, railroads owned and leased, equipment, real estate with schedules of property, maintenance of structures, power plant and equipment, improvements, litigation, taxes and other incidental matters.

The following is the statement of income for the six months ended June 30, 1912:

Operating income:		
Passenger revenue		$6,536,944
Other street railway operating revenue:		
Advertising	$150,000	
Rent of equipment	6,506	
Rent of tracks and terminals	5,582	
Sale of power	95,013	
Miscellaneous revenue—rent of buildings and other property	1,624	
		258,727
Total revenue from street railway operations		$6,795,672
Total operating expenses		4,129,760
Taxes assignable to street railway operations		584,965
Income from street railway operations		2,080,945
Non-operating income:		
Dividend on securities owned ($212,000 per annum)	$106,000	
Interest revenue (interest on bank balances)	8,811	
Miscellaneous rent revenue (net)—real estate dept.	79,417	
		194,229
Gross income		$2,275,175
Deduct:		
Interest on funded debt, etc.		1,336,814
Net income available for interest on first real estate 4-per-cent bonds or other additional charges		$ 939,361
Deduct:		
Interest on first real estate and refunding mortgage 4-per-cent gold bonds	$325,983	
First installment of interest on adjustment mortgage 5-per-cent income gold bonds	236,150	
		562,134
Net income		$ 377,227

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Sept. 16.	Sept. 9.
American Tel. & Tel. (New York)	143⅝	144¼
Commonwealth Edison (Chicago)	138½	139
Edison Electric Illuminating (Boston)	290	290
Electric Company of America (Philadelphia)	*12¼	*12¼
Electric Storage Battery common (Philadelphia)	56¾	58
Electric Storage Battery preferred (Philadelphia)	56¾	58
General Electric (New York)	180½	182
Kings County Electric (New York)	129	129
Manhattan Transit (New York)	2⅛	2⅛
Massachusetts Electric common (Boston)	18½	18⅝
Massachusetts Electric preferred stamped (Boston)	76	76
National Carbon common (Chicago)	119	118
National Carbon preferred (Chicago)	117¼	117½
New England Telephone (Boston)	153	155
Philadelphia Electric (Philadelphia)	24	24½
Postal Telegraph and Cables common (New York)	85½	87
Postal Telegraph and Cables preferred (New York)	68⅝	69⅞
Western Union (New York)	81	81½
Westinghouse common (New York)	87	87¾
Westinghouse preferred (New York)	125	123½

*Last price quoted.

PERSONAL MENTION.

FRANK ESPY, Tiffin, O., has been appointed general manager of the light and power plants of the American Gas & Electric Company at Tiffin, Fremont and Fostoria.

J. D. HOIT, for some time past manager of the Buckeye Lamp Company of South America, with headquarters at Monterey, Mexico, has been appointed engineer of sales for Julius Andrae & Sons Company, Milwaukee, Wis.

I. J. STITT, Meadville, Pa., who has been wire chief for the Bell Telephone Company in the Meadville District, has been promoted to the position of wire chief of the Sharon District and will in the future make Sharon his home.

A. LARNEY, who has been manager of the New Business Department of the Consumers' Power Company, St. Paul, Minn., has been appointed sales manager for the Minneapolis General Electric Company, succeeding H. J. Gille, resigned.

C. B. COOK, for the past four years district office manager at Toledo, O., for Allis-Chalmers Company, has recently associated himself with Stevens-Duryea Company as representative in Ohio and Michigan. His headquarters will be in Toledo.

J. C. WATSON, who is well known in light and power circles in Chattanooga, Tenn., has accepted the position of superintendent of the new electric plant at Pulaski, Tenn.

WILLIAM L. LAIB, well known in engineering and machinery circles and for many years manager of the Hanna Engineering Works, has joined forces with the Reynolds Electric Flasher Manufacturing Company, Chicago, Ill., in the capacity of secretary and treasurer.

CHARLES O. ANTHONY, for the past nine years connected with the New York Insulated Wire Company, has been appointed on the sales staff of the Walpole Rubber Company (Massachusetts Chemical Company Department), with headquarters at 80 Reade Street, New York, N. Y.

H. G. D. NUTTING, manager of the municipal water and light plant at Fort Atkinson, Wis., for the past three and one-half years, has accepted a position as district superintendent with the Central Illinois Public Service Company. Mr. Nutting was unusually successful in the operation of the water and light plant at Fort Atkinson. He will be succeeded by W. D. Leonard.

A. W. BULLARD, general manager of the Great Western Power Company, and P. T. HANSCOM, general superintendent, have returned to San Francisco from a trip of inspection of the construction work in progress at Big Meadows dam and Los Plumas power house. Seven hundred men are working on the dam and 75 on the power-house extension.

CHESTER R. ROSS has joined the staff of Walter B. Snow, publicity engineer, Boston, Mass., as manager of the Addressing and Mailing Department. Mr. Ross brings to this position an extended experience, covering three years with the Griffin Wheel Company, four years with the Boston *Transcript*, and a considerable period as salesman in various lines of industry.

R. R. HOBBS, who for 25 years has been connected with the Telegraph Department of the Louisville & Nashville Railroad Company, Louisville, Ky., has been promoted to the position of superintendent of telegraph of his company, and will be second in command to the superintendent of transportation. This road has decided to operate its own telegraph service, after having been served by the Western Union for several years.

H. C. SPECHT, who for some time has been connected with the Engineering Department of the Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pa., is about to leave this country for Germany, and will be abroad for some time. Mr. Specht will be engaged as chief engineer in connection with the construction work of a large textile firm, the Norddeutsche Wollkaeminerei & Kammyarn Spinnerei, Delmanhorst, near Bremen, Germany.

J. McA. DUNCAN, Pittsburgh, Pa., who has been in the employ of the Westinghouse Electric & Manufacturing Company for the past 25 years, has been named as head of the sales force of that company for the Pittsburgh District to succeed W. F. Fowler, who has taken up work for the W. H. Kuhn Corporation in the same city. Mr. Duncan has held several positions since starting with the company as shipping clerk, when the plant was located in Garrison alley. His new offices are in the Union Bank Building.

MAX LOEWENTHAL, well-known to the electrical industry as an expert on electrical treating, has resigned his position as manager of the Electric Shop of the Philadelphia Electric Company, and has assumed the position of sales manager of the Helion Electric Company, Newark, N. J., manufacturers of electrically heated appliances, using Professor Herschel C. Parker's well-known helion units. Upon leaving the Philadelphia Electric Company, Mr. Loewenthal was presented with a handsome loving cup by his associates.

EDWIN J. CLAPP, assistant professor of trade and transportation in the New York University School of Commerce, has been appointed traffic expert of Boston, Mass. He has been granted a year's leave of absence, which will be spent studying conditions in Boston and other Atlantic Coast cities. Doctor Clapp is a graduate of Yale and received a doctor's degree from the University of Berlin. He was instructor in Economics in Yale before going to the University of New York, and is the author of well-known books on trade and traffic conditions.

HENRY L. DOHERTY, former president of the National Electric Light Association, gave a dinner in honor of E. Mackay Edgar, of London, England, winner of the Harmsworth motor-boat trophy, at Delmonico's, New York City, on the evening of Tuesday, September 10. The occasion was a particularly enjoyable one. Each guest received a hand-painted menu carrying the British and American flags entwined. Among those present were Leslie M. Shaw, Martin W. Littleton, Warren W. Foster, Frank J. Sprague, George Williams, Charles A. Frueauff, T. C. Martin, Charles W. Price, Paul Jones, Harold Binney and W. C. L. Eglin. Mr. Edgar sailed for London the following day.

CHARLES HOMER SEAVER, assistant to the advertising manager of the Commonwealth Edison Company, of Chicago, Ill., was married to Miss Grace M. Marsh on August 26. Mr. Seaver is a graduate of the University of Kansas and was connected for three years with the General Electric Company's Testing and Advertising Departments at Schenectady. Subsequently for over two years he was an associate editor of the ELECTRICAL REVIEW & WESTERN ELECTRICIAN, and took his present position at the beginning of this year. Mr. Seaver met his charming bride while both were on the staff of this journal in the old Marquette Building offices. Both his and her associates extend to the happy couple their sincere congratulations.

LUCIUS I. WIGHTMAN, well known as a technical writer and publicity manager in connection with the manufacturers of electrical and power machinery, announces his connection with the Technical Department of Joseph A. Richards & Staff, Tribune Building, New York City, under the firm name of Wightman & Richards, counselors and consulting engineers in technical advertising and marketing. This represents an association of Joseph A. Richards, Mr. Wightman and Paul Morse Richards. Joseph A. Richards is the head of the agency which was founded by him in 1872, and has since been identified with a number of conspicuous national advertising campaigns. Mr. Wightman and Mr. Richards bring to the advertising field a great deal of experience and ability, particularly of value to technical advertisers.

H. H. CUDMORE, manager of the Brilliant Electric Works of the General Electric Company, Cleveland, O., wishes us to announce that he is not a candidate for the position of Eleventh Jupiter of the Order of the Rejuvenated Sons of Jove. There has been a good deal of talk of the possible candidacy of Mr. Cudmore, and he has been approached on the subject by many of the most prominent officers and statesmen of the order. He has given the matter a deal of thought and consideration, and after careful analysis and a true appreciation of the honor of even being suggested for this great office, states that it will not be possible for him to be a candidate. His pressing duties in connection with the Brilliant Electric Works have caused him to set aside any ambition he or his friends may have in this connection. Mr. Cudmore's friends in the order are already making some effort in his behalf and it is his wish that they devote their time to considering the qualifications of others who will announce themselves as candidates in the near future.

OBITUARY.

WILLIAM MURPHEE, died September 11 in the Sharon (Pa.) Hospital at the age of 43. Mr. Murphee went to Sharon only a short time ago from New York, where he had charge of the electrical plant in Central Park. He leaves a widow and one child.

J. M. GARRETT, an electrical engineer of the Western Union Telegraph Company, died on September 12, after a short illness, at his home, 451 East 239th Street, the Bronx, New York. He was a Mason and a member of the Royal Arcanum. Mr. Garrett left a wife and child.

W. EARL REESE, day engineer of the Kentucky Electric Company, Louisville, Ky., died of injuries received when his motorcycle collided with a street car. Mr. Reese had been day engineer of the Ky-El-Co station for several years and was regarded as one of the most expert members of his pro-

fession. He leaves a widow and child.

EDWARD A. CALAHAN, inventor of several important telegraphic devices, died September 12 of heart disease at his home, 215 Cumberland Street, Brooklyn, N. Y. Mr. Calahan was born at Boston in 1838, and was educated in the common schools of that city. His first position was in a Boston telegraph office. He went to New York in 1861 as chief operator of the Western Union Telegraph Company in Manhattan and made his residence in Brooklyn. In 1867 he invented the gold and stock ticker and organized the Gold & Stock Telegraph Company. In 1871 he organized the American District Telegraph Company. In 1872 he resigned as general superintendent of the Gold & Stock Telegraph Company and went to London, England, where, with P. B. Delany he organized the Exchange Telegraph Company, Limited. In 1873 he invented the American Distric automatic messenger call box. His last invention was the multiplex telegraph system, by which it was made possible to transmit 72 different messages over the same wire. Mr. Calahan left a widow and four children.

With the Electrical Manufacturers

The Findlay Electric Porcelain Company, Findlay, Ohio, manufacturers of the Findlay interchangeable self-centering split knob, is seeking a new location for the erection of a modern porcelain plant.

Lux Manufacturing Company, 52 Grove Street, New York City, has issued a circular calling attention to its new Flexilux tungsten lamp. This lamp is said to embody all of the rugged features of the carbon lamp and the best points of the present wire tungsten lamp, thus giving a combination of high efficiency and long life.

The Cravens Electric Company, Chicago, Ill., announces the removal of its office from the Commercial National Bank Building to 12 and 14 S. Jefferson Street, Chicago. This change is made necessary by the rapidly growing business of the company. A large new shop has been equipped, which, together with the location of the offices in the same building, permits the company to maintain very prompt shipments.

The Hanson & Van Winkle Company, Newark, N. J., has isued several circulars calling attention to some of its new products. Among these is one describing the Universal wheel trimmer; this is a very serviceable tool for turning up, buffing and polishing wheels. Another circular describes the advantages of Kostico, which is an improved cleaning caustic, particularly serviceable for removing grease and oil without discoloring or oxidizing the most highly finished metal work.

Allis-Chalmers Company, Milwaukee, Wis., has issued Bulletin No. 1526, which describes the latest developments in Allis-Chalmers Corliss engines. These engines have had a long and enviable reputation and continue to give excellent satisfaction to their users. The bulletin describes in detail improvements that have recently been made in the design that serve to produce a still more rigid construction and better operating characteristics. The important parts of the engine are illustrated, as well as a number of typical installations.

The Reynolds Electric Flasher Manufacturing Company, 617 West Jackson Boulevard, Chicago, Ill., announces that an extensive expansion of its business is under way, and special lines such as transformers, colored lamp hoods, sockets, motors, as well as a complete line of supplies in addition to its large line of flashers, will be added. William L. Laib, for many years manager of the Hanna Engineering Works, has become connected with the Reynolds Electric Flasher Manufacturing Company in the capacity of secretary and treasurer.

General Electric Company has given orders for the construction of four new structures in connection with its plant at Lynn, Mass. One of them will be a new office building, the present building being too small. This building will stand near the main entrance of the works and will be of steel-frame, and brick construction, with concrete floors. It will be four stories high and its floor dimensions will be 215 by 52 feet. Another building will be an iron foundry, two stories in height. The third structure will be a sub-office building. All these new buildings will be of brick and concrete construction.

National Tube Company, Pittsburgh, Pa., has issued a book entitled "Modern Welded Pipe." It gives a short history of this industry and contains much valuable, up-to-date information relative to modern tubular products. Of particular interest will be found the section relative to pipe-threading dies, also that dealing with corrosion of pipes and tubes and giving comparative results of the relative corrosion of wrought iron and steel. The company, both as a protection to itself and to its patrons, has established the practice of rolling the name "National" in raised letters upon every few feet of its welded pipe.

The Lagonda Manufacturing Company, Springfield, O., has published bulletin R-1 entitled "Lagonda Strainers." The catalog first points out why a strainer is necessary and how much power is lost in plants, due to decreasing the vacuum by restricting the flow of condenser circulating water. The various sizes and types of strainers are illustrated. The points of superiority of this strainer are also taken up and photographs included showing how these strainers may be buried under the floors of boiler rooms with only the hand wheel projecting above the surface, thus not reducing the available floor space and at the same time the strainer can be readily cleaned. Copies of this catalog may be had by addressing the Lagonda company.

K. McLennan Company, Chicago, manufacturer of Gale's commutator compound, has recently further fortified its selling force by closing agencies in Spain and Portugal. This company has agencies all over the world, and its foreign business is broadening rapidly. The company has recently made some very large shipments to Japan, and is doing a large business in other foreign countries. Gale's commutator compound has been successfully used for the past 15 years, the company having devoted its entire attention to this one specialty. The company has continually experimented with this product and constantly improved it, and now claims to have the best compound on the market.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., reports that among the recent orders received by it are the following: Rio de Janeiro Tramway Light & Power Company, Rio de Janeiro, Brazil, for 100 No. 304 Motors, 110 K-35-G controllers; the Milwaukee Electric Railway & Light Company, Milwaukee, Wis., for 30 quadruple equipments of No. 306 CA-2 motors and K-35-G control; the Washington Railway & Electric Company, Washington, D. C., 20 quadruple equipments of No. 323-A motors and K-31-A control; the Birmingham Railway, Light & Power Company, Birmingham, Ala., 10 quadruple equipments of No. 305 motors and type HL control; the New York State Railways Company, Rochester, N. Y., 20 double equipments of No. 307-A-3 motors and K-Z-3 control.

The Viking Electric Company, 150 Chamber Street, New York, has issued bulletin No. 2, describing the Viking bell ringer. In this bulletin there is a special message to the contractor, indicating the growing demand all over the country for bell-ringing transformers, not only for bell work, but also for door openers, gravity drop annunciators, gas lighting devices, spark coils for gas engines, and electric clocks and other purposes. Full descriptions, dimensions and prices of the various types are given in the bulletin, together with wiring tables, data sheets, giving results from tests made on several types of Viking ringers. There are also some very interesting and valuable data with regard to the calculations involved in the installation and working of bell circuits with transformers. This booklet should be in the hands of every contractor and engineer interested in this subject.

DATES AHEAD.

The 1912 Boston Electric Show, Mechanics' Building, Boston, Mass., September 28 to October 26.

Association of Iron and Steel Electrical Engineers. Annual convention, Hotel Pfister, Milwaukee, Wis., September 30-October 5.

American Electric Railway Association and its five affiliated associations. Annual convention, Chicago, Ill., October 7-11.

Electric Vehicle Association. Annual convention, Boston, Mass., October 8.

Railway Signal Association. Annual meeting, Quebec, Can., October 8-11.

The New York Electrical Exposition and Automobile Show. The New Grand Central Palace, New York City, October 9-19.

Sons of Jove. Annual convention, Pittsburgh, Pa., October 14-16.

New England Section of the National Electric Light Association. Fall meeting, Boston, Mass., October 15-17.

Kansas Gas, Water, Electric Light and Street Railway Association. Annual meeting, Manhattan, Kas., October 17-19.

Association of Railway Electrical Engineers. Annual convention, Chicago, Ill., October 21-24.

Illinois State Electrical Association. Annual convention, Peoria, Ill., October 22-24.

Old Time Telegraphers' and Historical Association and the Society of the United States Military Telegraph Corps. Annual convention, Jacksonville, Fla., October 22-24.

Indiana Electric Light Association. Annual convention, Indianapolis, Ind., October 23 and 24.

Association of Telephone Pioneers of America. Annual convention, New York City, November 14-15.

Ohio Society of Mechanical, Electrical and Steam Engineers. Annual meeting, Akron, O., November 21-22.

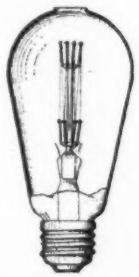
American Mining Congress. Fifteenth annual meeting, Spokane, Wash., November 25-28.

Record of Electrical Patents.

Issued by the United States Patent Office, September 10, 1912.

1,037,871. Railway Signaling Mechanism. W. J. Cook, assignor to Cook Railway Signal Co., Denver Colo. A weighted semaphore arm is raised by an electric motor whose circuit is electromagnetically controlled by track devices.

1,037,879. Pumping System. E. L. Dunn, assignor to Standard Plunger Elevator Co., New York, N. Y. A pressure-controlled solenoid governs a pilot valve.



1,038,076.—Renewed Lamp.

1,037,883. Waterproof Cable. H. W. Fisher, assignor to Standard Underground Cable Co., Pittsburgh, Pa. The conductor has successive layers of non-absorbent insulation, varnished cloth, asphaltum and varnished cloth.

1,037,887. Process of Plating Metals. M. W. Franklin, assignor to General Electric Co. Glass is prepared for electroplating by first coating it with a soluble gum, then applying a powdered metal to the gum, and finally electroplating.

1,037,901. Carbon Article. C. A. Hansen, assignor to General Electric Co. A carbon brush made by molding with a binder, baking below 600 degrees centigrade, impregnating with another binder and firing above 1,200 degrees.

1,037,917. Signaling Device for Cash Registers. M. Jacob, assignor to National Cash Register Co., Dayton, O. Electric lamps are lighted for a short time after each registration.

1,037,927. Telegraphy. I. Kitsee, Philadelphia, Pa., assignor of one-half to W. J. Latta. A duplex system with a battery at each end of the line connected in opposition.

1,037,932. Electric Heater. F. Kuhn and F. E. Shailor, assignors to American Electrical Heater Co., Detroit, Mich. A toaster with a vertical double grid frame.

1,037,941. Apparatus for Curing Meat. J. C. Lincoln, assignor to Electric Meat Curing Co., Cleveland, O. Provides for an electrolytic process for impregnating the preservative.

1,037,964. Electric Switch. H. J. Morey and F. A. Brogden, Syracuse, N. Y. A snap key for a lamp socket.

1,037,969. Trolley Guard. F. J. Nolan, assignor to Shur-On Trolley Guard Co., Buffalo, N. Y. A number of guard wires are arranged lengthwise on opposite sides of the trolley wire.

1,037,972. Electrocapillary Instrument for Detecting and Recording the Passage of Electric Impulses. A. Orling, assignor to Orling's Telegraph Instruments Syndicate, Ltd., London, Eng. Comprises two oscillating members, one with a capillary tube containing mercury and acting as a scriber for the recording mechanism, the other serving to vibrate the record-receiving medium.

1,037,979. Process and Apparatus for Welding. F. C. Perkins, Buffalo, N. Y. To the electrodes of an arc is fed a combustible gas and oxygen.

1,037,989. Socket-cover for Light Fixtures. G. A. Richards and A. J. Price, Watertown, Wis. The body and cap are provided with registering eyes and spring latches.

1,037,994. Socket for Incandescent Electric Lamps. J. J. Rooney, New York, N. Y. A pull-chain socket for a double-filament turn-down lamp.

1,037,998. Coil-Forming Apparatus. M. Sandfield, assignor to Westinghouse Electric & Manufacturing Co. Consists of a series of clamps, levers and a shaft and connecting links between them.

1,038,011. Tool-Holder. A. C. Snell, assignor to Electro Surgical Instrument Co., Rochester, N. Y. A surgical instrument has a miniature incandescent lamp at its side and connected through the holder to the circuit.

1,038,016. Magnetic Speedometer. J. K. Stewart, Chicago, Ill. A rotating magnet is connected to the index.

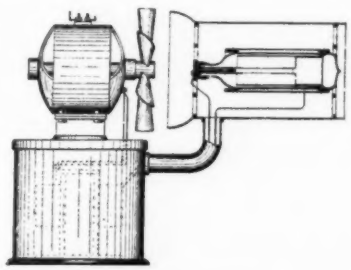
1,038,037. Telephone System. H. G. Webster, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Relates to the relays and control for the ringing circuits.

1,038,070. Adjustable Extension Socket. R. B. Benjamin, assignor to Benjamin Electric Manufacturing Co., Chicago, Ill. An adapter with a plug at one end, a socket at the other and an inclosed hinge joint between.

1,038,071. Portable Protected Lampholder. R. B. Benjamin, assignor to Benjamin Electric Manufacturing Co. Has a heavy socket protector with guard strips about the lamp and a hook at the end.

1,038,072. Reflector Shade. R. B. Benjamin, Chicago, Ill. The inside of the reflector is made of three successive parabolic surfaces.

1,038,076. Incandescent Electric Lamp and Method of Renewing the Same. R. Berrenberg, Boston, Mass. The lamp tip and old filament carrier are removed, a new carrier with metal filament inserted, sealed and connected to the stem and leading-in wires and the bulb resealed.



1,038,130.—Ozonator.

1,038,093. Conduit Fish-Wire Machine. F. Crawford, assignor to Conduit Threading Device Co., Pasadena, Cal. Consists of a frame, means to store the fish-wire thereon, and a single-axis rotary clamp on the frame with respect to which the fish-wire is fed tangentially.

1,038,117. Electric Annunciator and Signaling System. F. C. Graham, New York, N. Y. Each shutter is controlled by the connected cores of a pair of solenoids.

1,038,122. Electrolytic Water-Purifier. V. B. Hagg, assignor to Continental Water Purifying Corporation, Los Angeles, Cal. The electrode chambers are separated by a perforated wall.

1,038,129. Electric Railway Signaling System. M. L. Hein, Victoria, Australia, assignor of one-half to J. Copp. Provides signals along the track and in the motorman's cab.

1,038,130. Apparatus for Producing Ozone. S. Held, Chicago, Ill. A vacuum tube with a tubular electrode is surrounded by an external electrode and air is passed between the tube and outer electrode.

1,038,131. Magnetic Clutch. V. Hemming, New York, N. Y., assignor to H.

Krantz Manufacturing Co. Has two solenoids and three magnetic disks for driving a shaft at right angles in either direction.

1,038,135. Photographing Machine. J. Herricht, New York, N. Y. An arc lamp is automatically controlled from a cabinet.

1,038,151. Lamp Socket. C. J. Klein, assignor to Cutler-Hammer Manufacturing Co., Milwaukee, Wis. Includes a pull-chain switch with a toothed wheel and a reciprocating rack.

1,038,194. Method of Preparing Halogen-Oxygen Compounds by Electrolysis. M. Pier, assignor to E. I. du Pont de Nemours Powder Co., Wilmington, Del. Consists in adding to the electrolyte in acid solution a compound of the rare earth metals.

1,038,206. Signal. E. E. Salisbury, assignor to Signalphone Alarm Co., Milwaukee, Wis. In series with an electromagnetically operated gong is an incandescent lamp.

1,038,208. Electrode. O. Schönherr and J. Hessberger, assignors to Norsk Hydro-Elektrisk Kvaelstofaktieselskab, Christiania, Norway. A furnace electrode is surrounded by a hollow holder to provide circulation for a cooling medium.

1,038,213. Selector for Automatic Telephone Exchanges. B. Settegast, assignor to Deutsche Telephonwerke G. M. B. H., Berlin, Germany. Relates to the arrangement of the contact banks.

1,038,252. Reinforced Grid Resistance. H. J. Wiegand, assignor to Cutler-Hammer Manufacturing Co., Milwaukee, Wis. U-shaped reinforcing strips grip the edges of the grid and are insulated therefrom by asbestos and waterproof material.

1,038,254. Electric-Current Generator. J. M. Wilson, assignor to Splitdorf Electrical Co., Newark, N. J. A magneto with permanent, series and shunt magnetic fields.

1,038,258. Pyrometer or Thermo-Battery. J. L. Zander, Irvington, N. J. Includes a thermo couple, heat-collecting rifles and a mirror.

1,038,277. Transformer Attachment for Spark Plugs. S. F. Briggs, assignor to Briggs & Stratton Co., Milwaukee, Wis. An induction coil is connected directly to the plug.

1,038,278. Semaphore Signal. W. W. Brown, assignor to Union Switch & Signal Co. Has an electric motor for raising the arm.

1,038,284. Push-Button Electric Switch. H. Cahen, assignor to Hartman & Braun A.-G., Frankfort-on-Main, Germany. Has a specially formed spring contact member.

1,038,296. Signal. A. G. Clark, assignor to Union Switch & Signal Co. A step-by-step selector controlled by electromagnets, a ratchet wheel and pawl and retarding device.

1,038,301. Telephone and Telegraph Relay or Repeater. J. H. Cuntz, Hoboken, N. J. Includes an auxiliary coil through which flows a regularly varying current from an independent source, and coils in circuit with the line wires, and in inductive relation to the auxiliary coil.

1,038,320. Electric Controller. G. B. Dusinberre, Cleveland, O. Includes compressible resistance units with a fluid equalizer to cause each resistance column to absorb the same amount of energy.

1,038,337. Alternating-Current Motor. V. A. Fynn, Blackheath, England. Includes a main inducing winding, a field winding and a double-circuit induced winding.

1,038,338. Alternating-Current Motor. V. A. Flynn, London, England. A single-phase motor with a main winding embracing all the static laminations and a field winding including only one slot per pole.

1,038,342. Adjustable Automatic Rheostat. C. H. Gaylord, Chicago, Ill. A rotatable cylinder carries spirally wound resistance wire on which a traveling brush contacts.

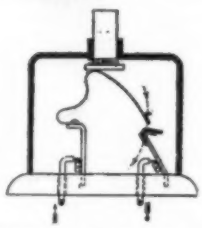
1,038,343. Apparatus for perforating Tape for Automatic Telegraph Instruments or the Like. J. Gell, London, Eng. Includes a set of key-controlled marking-hole and spacing-hole punches.

1,038,364. Block Signal System. L. A. Hawkins, assignor to Union Switch & Signal Co. Is operated by alternating-current circuits.

1,038,365. Indicator. L. A. Hawkins, assignor to Union Switch & Signal Co. A motor-operated three-position semaphore.

1,038,402. Temperature-Controlling Apparatus. A. MacPhee, New York, N. Y. A solenoid-controlled mixing damper between the hot and cold-air ducts.

1,038,410. Electric Heater. F. P. Mies,



1,038,284.—Push-Button.

Chicago, Ill., assignor to Plural System Ventilator Co. Resistance wire is wound on open truncated-cone like frames.

1,038,415. Electric-Light Socket. F. T. Moreland, Oakland, Cal., assignor of one-half to P. H. Petersen. A porcelain keyed socket with spring ribs in the shell.

1,038,416. Theatrical Schedule and Advertising Cabinet. T. W. Mullaly, Fort Worth, Tex. Within the cabinet are incandescent lamps for lighting up both sides.

1,038,418. Insulator. W. H. S. Nelson, Capon Springs, W. Va. Has a wire-receiving groove, the walls of which are recessed to form widened slots and shoulders.

1,038,419. Telephone Calling Device. R. C. Nevin, Oakland, Cal. On the upright of a desk set is a vertical row of finger holes through which a circuit-breaking piston may be engaged.

1,038,422. Resistance Element. J. J. Nolan, Linton, Ind. The wire is looped between notches in opposed ribs on the base.

1,038,437. Trolley-Catcher. C. H. Reames, Fort Worth, Tex., assignor of one-fourth to D. Tubbs and one-fourth to R. Hill. An automatic trip for trolley poles.

1,038,438. Electroresponsive Vibrator-Movement. C. H. Rettmann, Chicago, Ill. A special magnet construction for an electric bell.

1,038,450. Signal. R. C. Showalter, Altoona, Pa. A semaphore controls the switch for an electric signal lamp.

1,038,451. Current Distributer and Timer. J. M. Smith, Philadelphia, Pa., assignor of one-half to W. D. C. Wright. For the ignition circuit of a gasoline engine.

1,028,460. Means for the Prevention of Racing of Marine Engines. Felix Tanner, Sydney, N. S. W., Australia. A solenoid controls the throttle valve.

1,038,473. Insulator. J. Alsberg, New York, N. Y. The conductor is hung from an insulating rope protected by tubular and petticoat sections.

1,038,494. Dynamo-Electric Machine. L. W. Nelson, Philadelphia, Pa. The field and armature are parallel with a radial-plane air gap between them.

1,038,495. Boiler-Timing Device. F. W. Wood, New York, N. Y. A reversible motor moves an arm that actuates the circuit-closers for the transmitter.

1,038,506. Apparatus for Aerial Signaling and Similar Purposes. W. G. Spiegel, New York, N. Y. A kite carries wireless antennae connected to earth through wires serving also for controlling the kite.

1,038,508. Sleet-Cutting Trolley. D. E. Barton, Milwaukee, Wis. J. H. Spence administrator of said D. E. Barton, deceased. A circular sleet shoe has a peripheral ring provided with transverse slots.

Patents That Have Expired.

Following is a list of electrical patents (issued by the United States Patent Office) that expired September 17, 1912.

546,308. System for Controlling Railway Trains. A. L. De Leeuw, Springfield, O.

546,324. Dynamo Telegraphy. A. S. Harris, Minneapolis, Minn.

546,357. Telephone. I. D. Smith, Pittsburgh, Pa.

546,361. Pliers for Trimming Electric Arc Lamps. R. D. Tackaberry, Lewiston, Me.

546,388. Electric Arc Lamp. S. P. Parmly, Chicago, Ill.

546,389. Underground Conduit for Electric Railways. H. A. F. Petersen, Milwaukee, Wis.

546,403. Arc-Lamp Mechanism. K. A. Lantau and C. J. Anderson, Chicago, Ill.

546,417. Thermo-Electric Generator. H. B. Cox, Hartford, Conn.

546,442. Electric Motor. F. H. Williams, Greene, N. Y.

546,476. Electric Converter. C. F. Scott, Pittsburgh, Pa.

546,483. Electrodepositing Apparatus. H. L. Bridgman, Blue Island, Ill.

546,494. Insulating Railroad Joints for Electrical Signals. T. O'Brien, Jr., Philadelphia, Pa.

546,523 Lightning Arrester and Cutout. O. Gieseke, Lake Charles, La.

546,534. Electric Arc Lamp. D. Higham, Boston, Mass.

546,546. Electric Railway. H. M. Montgomery, New York, N. Y.

546,551. Thermometric Circuit-Closer. R. Pearson, London, Eng.

546,553. Electric Calculator. W. C. Porter, Arlington, Minn.

546,560. Electric Locomotive. S. H. Short, Cleveland, O.

546,579. Insulated Electric Conductors. F. Clouth, Cologne, Germany.

546,582. Electrical Piano. G. H. Davis, New York, N. Y.

546,613. Electric Fusible Cutout. D. N Gleason, Brooklyn, N. Y.

546,625. Electric Arc Lamp. H. A. Seymour, Washington, D. C.